HOW TO MAKE THE GARDEN PAY

MORRISON AND BRUES

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HOW TO MAKE THE GARDEN PAY

HOW TO MAKE THE GARDEN PAY

A Manual for the Intensive Cultivation of Home Vegetable Gardens

BY

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AND

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PREFACE

It is the purpose of this book to tell both novices and experienced gardeners something about ways and means of making small gardens profitable. There are many good books on gardening, but none, to our knowledge, has been written specially for those who wish to cultivate a small area intensively with the object of increasing as much as possible the home food-supply.

Gardening for purely utilitarian ends has now become highly desirable and is as capable of giving health and happiness as merely recreative gardening. There are very many men and women who can give to a garden only a small part of their time and who desire that every hour in it shall be efficiently spent. Knowledge of what to grow and how best to grow it on a small area may well be taught the younger part of

our population at a time when conservation and increase of the nation's food-supply are the duty of all who are beyond infancy.

For many years the authors have had experience as home gardeners and have been students of subjects directly and indirectly bearing upon gardening. It is their hope that this little book will be found practically useful as well as scientifically sound, and that it may stimulate interest in the greatest material need of the United States in the near future, adequate cultivation of the soil.

EDWARD MORRISON
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FOREST HILLS,
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HOW TO MAKE THE GARDEN PAY

I

RIGHT PLANNING

HOME gardening is seldom the subject of thought or study by those who pursue it as an avocation, to the end of planting the things most needed for the home table. Still less attention is usually given to using the home plot so as to grow on it as much as possible and to improve it from year to year. Market gardeners find out what is likely to be needed, what their land will produce best, how to make the soil richer instead of poorer by the continual raising of crops, and how to apply the principles of efficiency to their work. Why should not the home gardener do likewise?

It is especially desirable to study this subject at a time when food is scarce or high-

priced. A home garden, properly cultivated, can be made to reduce the cost of living to a surprising and gratifying extent. And when foodstuffs are needed as much as military service or ammunition for the nation's defense, to cultivate a garden is an act of national as well as individual benefit. Every vegetable grown for home use should lessen the demand of the grower's family for the foods needed by men in the service directly of the nation. Furthermore, all that is learned in gardening is of use in farming, and the great need of the present time is an increase in the number of efficient farmers.

What is the best use that can be made of a garden, small or large, by a man, woman, boy, or girl who has a little time to give to it each day or when the work is most needed? The answer to that question involves several other questions about varying conditions. We must ask, first of all, what is most needed from the particular garden; other important considerations are what it will grow well, how large it is, and how long and by what

methods it can be cultivated. All these have relation one to another.

When staple foods are low-priced and the family income is sufficient to buy all the food needed, without hardship, it would be unwise for any one to grow potatoes, beans or peas for drying, or onions, in a small home garden. The things to be raised under such conditions are the vegetables that lose quickly their fine flavor when taken to market, such as green corn, green peas, string beans, cucumbers, radishes, and lettuce. Fresh from the garden, these are immeasurably better than vegetables of the same kind that have been picked many hours, perhaps several days, before they are eaten and have been kept with little or no care as to what their condition will be when they reach the consumer. But if staple foods are scarce or likely to become scarce, or the family income is low, the home garden may well be used for the production of peas, beans, and corn, the seeds of all of which have a high food value and can be dried as well as eaten green, and

of onions, potatoes, parsnips, beets, carrots, turnips, cabbages, and winter squashes, which will keep well, in storage places under roofs or in pits, for several months.

Considering this subject, it is well to bear in mind that many fresh green vegetables are very desirable for general health, whether or not they contain a large amount of matter having caloric value as food. Some of the least valuable of them, with respect to the protein, fat, and carbohydrates that make such value, contain mineral matter needed by the human body. A well-balanced diet, whether it includes animal food or is purely vegetarian, must make use of fresh vegetables that are low in caloric food value. These vegetables, however, should not occupy land unnecessarily; in the home garden they should be grown as intensively as possible, when food prices are high.

How large the garden is should determine, for most cultivators, what is to be planted in it. If it is a half-acre or more in extent it may economically grow, for the family of ordi-

nary size, both staple and fresh vegetables; if it is only a small back yard, the raising of lettuce and radishes in it may be wise, considering how beneficial those vegetables are when combined with food that can be bought readily and will give caloric value. A garden of an acre may properly include, for example, watermelons if the family is extraordinarily fond of this vegetable and does not really need the land on which it grows for other purposes. But watermelons have a very low food value; they are economically grown by specialists, in regions most favorable for their development; they are shipped long distances and exposed a long time in market-places, without injury to their quality, and their vines occupy much ground, not to speak of the difficulty of protecting the fruit from marauders. To plant watermelons would be absurd for a family that needs beans.

What the soil will grow best depends on its quality and natural conditions, the use that has been made of it, the fertilizers that are

to be had, the possibilities of artificial watering, the amount of sunshine that it receives, and many other conditions. In the directions for growing each vegetable an attempt has been made to outline specifically needs in these respects, but some general consideration may be of value.

Soils, for gardening purposes, are divisible into those containing loam, clay, sand, and gravel. Loam is rich in plant food; it contains much decayed vegetation, and is loose or friable according to the amount of sand it contains. When clay is present in loam to any large extent, the mixture makes a soil commonly called stiff or cold loam. Clay helps loam or sand to hold moisture, and is often of benefit in a subsoil or, in small proportion, in a top soil. Sand alone has no nutritive power, but when enough humus — decayed vegetable or animal matter, — is added to it, the combination is excellent for growing many kinds of plant life. Gravel is present in many surface soils and when small has something of the beneficial effect of sand,

but in general it makes the soil poor and hard to cultivate. Humus is added to the ground whenever manure is worked into it, and as most soils need humus, stable manure, which contains both vegetable and animal matter, is the best fertilizer that can be used in most gardens.

For the growing of garden vegetables, three elements must be in or be added to the soil — nitrogen, potash, and phosphoric acid. Nitrogen makes an abundance of leaf growth, potash makes stalk and fiber, phosphoric acid stimulates the production of fruits and flowers. In what is called a "complete fertilizer" all three of these are present. A soil rich in nitrogen, usually a black or dark-colored soil, is capable of producing well, with a moderate amount of potash, cabbages, spinach, asparagus, celery, lettuce, endive, and Swiss chard. It needs little phosphoric acid, because we do not eat the fruits of these vegetables. Phosphoric acid is needed, of course, to grow such vegetables for seeds. Potash is especially needed to produce root

and bulb crops, such as potatoes, parsnips, onions, beets, carrots, and turnips, and the stalk part of corn, bean vines, cabbages, tomatoes, etc. A large amount of phosphoric acid causes large production of the seeds that are eaten, such as corn, beans, and peas, and of the fruits surrounding or containing seeds, such as tomatoes and string beans. The novice may learn, in a season's gardening, what of these three constituents his soil needs most, and supply it in the following season by the addition of animal manures, artificial fertilizers, or "green manure," the gardener's term for vegetation turned into the ground.

At the beginning of work in a particular garden, something may be determined of what the garden will grow well, by the previous season's use of the soil. If it has been used for known crops, plant something of different nature — corn where beans, peas, or root crops have been grown, and root crops where above-surface crops have been grown. With the addition of a liberal amount of

stable manure to the garden of unknown history, anything may be tried in it, the first year, that the gardener wishes to grow and that seems likely to do well. A trial sometimes develops gratifying surprises.

Since the outbreak of the great European war, potash has been very difficult to get for farms and gardens, owing to the fact that we depended on substances from German mines for the supply. Wood ashes in the North and cotton-hull ashes in the South have been our chief sources of potash, aside from the amount contained in stable manures. Guano and nitrate of soda, imported and very valuable fertilizers containing nitrogen, are out of the market at the time of writing (May, 1917). Under these conditions it is important to rotate crops as carefully and intelligently in the small garden as on the farm and to return directly to the soil as much as possible of the material taken from it.

Every gardener should have and work from a plan, to scale, of his garden, if it contains more than a few square feet. Make

such a plan, on a large sheet of tough paper, each winter. Note on it what has been grown as well as what is to be grown, so that a glance will show the sequence of crops. The authors' way of doing this is to mark the previous growth in blue or red lines and letters and the growth to come in black. Planting can be systematic and precise, by this method; there will be no guessing whether room can be found for certain seeds at the end of the planting, and no doubt as to where other things have been planted. A 50-foot or 25-foot cloth tape line will enable one to measure exactly the garden and lay it out from the plan, which should be large enough to make notes on it about the time of planting, gathering vegetables, fertilizers used, etc. If a new plan is made each year, the successive records become valuable. What any small garden is capable of cannot be discovered in one or even two years—sometimes not in many.

II

PROFITABLE METHODS

After inquiring what he shall plant and how he shall fertilize the soil, the novice in gardening usually asks what tools he should buy. It is as important to have tools of the right kind as to have good seeds or to enrich the soil properly, yet small attention is often paid to their selection. Good tools mean possibilities of efficiency, in every gardening operation.

A spade, a hoe, and a rake are the traditional garden tools, and the cultivator of the smallest patch of ground needs these, though he may profitably substitute the coal shovel for the ordinary spade and purchase instead a spading fork, with which he can turn up much more ordinary garden soil with less fatigue than with a solid spade. The solid spade, however, is useful for many purposes.

For lifting dirt or other loose substances a shovel is desirable, but this, as suggested, may be borrowed from the coal bin. If a shovel is bought specially for the garden, one with a point instead of a square end will be found most useful.

There is no more important tool than the hoe. The blunt hoe has only a small use in the intensively cultivated garden. Pointed hoes are far better for opening drills and cultivating between plants. In a garden of any size, at least two pointed hoes will be found useful, a large and a small one. The most useful tool for cultivating by hand that the senior author ever possessed was a narrow hoe, the head of which, about 7 inches long, was fixed at its middle to the handle; one end of the head was about $2\frac{1}{2}$ inches wide, and the other was a point. With this one could dig quickly between very narrow rows and cultivate outside the plants with a sliding stroke, so as to cut off even large weeds easily. The tool was so light that a child could use it for hours without complaining of its weight.

A heart-shaped hoe is good as the larger tool of this kind.

One of the best tools ever invented for hand cultivation is the scuffle or English push hoe, which should have a long handle. With this one can cultivate rapidly to a depth of about an inch between rows, and cut down every small weed. When rows are close together, such shallow cultivation does not disturb roots close to the surface, and some garden plants throw out roots horizontally. The push hoe also allows the gardener to walk backward as he works, so that he does not tread on the ground he has loosened. This gives it a decided advantage over the wheel hoe, for the latter requires that the gardener walk forward over the strip he cultivates, destroying in part the effect of loosening the soil by firming it again immediately and treading in loosened weeds so that they may easily grow again.

The garden rake commonly used has straight steel teeth about two inches long. This is a useful tool, but a lawn rake with

metal teeth bent so as to curve inward on both sides of the head and having a series of loops instead of sharp teeth on one side is far more useful. With the lawn rake lumps of soil can be broken up and paths can be smoothed, quickly and satisfactorily. The steel lawn rake is also very good for covering long rows of seeds.

There are many ingenious hand tools for combining the action of the hoe and rake or otherwise stirring the soil, but the simplest tools are the most satisfactory. One or two hand trowels are necessary. For setting out plants a tool called a dibble is commonly sold and used, but it is unnecessarily heavy. Essentially a dibble is a pointed, round rod or stick six to ten inches long with a handle. The best dibble is a shortened and sharpened top of some small wooden handle, such as the handle of a child's shovel, which can be grasped easily and weighs very little. In setting out plants there is no need of stooping or crawling about nearly as much as most gardeners stoop and crawl. It is quicker as

well as less tiresome to smooth the soil well with a rake and to punch a hole for each plant, while standing, with a long stick, such as an old broom handle sharpened to a point. Then drop a plant at each hole and you will need to stoop only to put it in the hole and press the earth quickly against it with a stroke of the dibble.

By spading up only the soil where the seeds are to be planted you may always stand on firm ground for planting — another convenience — and plant rapidly. The ground between rows can be spaded up later, and this is probably better for the plants. Each row should be marked and each bed enclosed, as it is planted, by strings stretched a foot or two above the ground, that can stand until the plants are out of the ground. Use white cotton twine, so inexpensive that it can be thrown away when the need of it for marking purposes is past. By using strings in this way there will be no doubt about where certain seeds have been planted, and spading between the rows can safely be done.

A wheelbarrow is a necessity in a garden cultivated intensively. In it all the tools needed can be taken out at once and other things easily carried. A side-dumping wheelbarrow is better for the garden than one with vertical sides.

For cutting lumps of spaded soil, an edging knife — a crescent of thin steel with a handle 4 to 5 feet long — is useful. Many writers on gardening advise that in spading, each lump upturned be broken into fine pieces with the spade. This is a slow and hard way of doing a desirable thing; the quick and easy way is to turn up the soil with the spading fork, then cut fine the lumps with the edging knife or a common hoe, and then use the steel lawn rake to pulverize them by alternate pulling and punching. The rounded head of the lawn rake is excellent for this purpose.

If much stable manure is to be handled in the garden, a manure fork will be needed. A potato digger will repay its small cost if many potatoes are to be dug. For making

soil suitable for seed boxes and flower pots, a sieve with meshes about one eighth inch apart is very useful. An indispensable thing is a line — but not the garden line commonly sold by dealers in gardening materials. That is several times as large as it needs to be. Buy instead a ball of the white cotton line commonly used by masons; that is small enough to be carried conveniently in the pocket, easy to handle and requires only light stakes to hold it. A pair of shears with blades 10 or 12 inches long is very useful; so is a grass hook. One cannot put up trellises, of course, without a hammer, and a hatchet or hand-axe is useful for sharpening as well as driving stakes. For making holes and as a strong lever, an iron bar will be useful.

All the tools used in the garden should be kept where they can be got at without delay, and all that are needed for a specific task should be taken out together. Half the time of many gardeners is wasted because not everything is at hand. Keep all cutting tools sharp; this means easy as well as thorough

work. A file will sharpen the edges, but a small grinder is better.

For a garden occupying a half-acre or more, a wheel hoe with attachments will be found economical. Such a hoe costs $4 to $14, at the time of writing. A wheel hoe is not advisable in a garden of less area, for hand tools can be used in smaller spaces than wheel tools and the work done with them is more effective. For the garden of more than an acre or two, horse cultivation is desirable.

In choosing garden tools, get those that are strong, but do not think that weight necessarily means strength. A spade or hoe has to be lifted many times in an hour's use, and should not contain an ounce of unnecessary weight. The lighter the tool the more rapidly even a very strong man should be able to use it, and he will be less tired when his task is done than if he had used a heavy tool. Most garden tools are poorly designed in this respect. Some day a manufacturer will surprise and delight the public by putting on the market tools light enough to be

used even by children without fatigue, yet strong and durable.

If the garden is permanent, it will pay to construct in it a small hotbed or cold frame. The hotbed and cold frame are nearly the same in construction; the only difference is that the hotbed has a pit into which horse manure can be packed in early spring, 2 to 3 feet deep, and this furnishes heat to soil that is placed on it, while the cold frame protects the things growing in it merely by providing for them a glass-covered box. For the sides of a frame, boards are used; the top is an old window or one or more hotbed sashes, the standard size of which is 3 feet by 6 feet. A single sash, glazed, sells at retail for about $4 and unglazed for about $2, in Boston. The gardener who wishes to construct a hotbed should seek information about its construction from the Department of Agriculture, Washington, D.C. By using a hotbed or cold frame, many plants can be started early, for setting out when the ground and air become warm. In summer the sash can

be taken off and the enclosed space made useful. Small vegetables can be grown late in the hotbed, or cold frame, and in winter it can be used as a storage pit for vegetables.

What kind of seeds to buy perplexes many an amateur gardener. A good seedsman's catalogue is an excellent guide in this respect, and there are many good seedsmen. But there are also seedsmen who describe seeds and plants in exaggerated terms. Get a catalogue from a house of established reliability and study it. Many catalogues give good planting directions in concise form. Make a list of what you want so that when you buy seeds you will not have a vague recollection of the amounts and kinds needed. Remember that there are early and late varieties of the best vegetables. In general, the name of the house that sells a packet of seed is worth more to the gardener than the name of the variety printed on the packet. Almost every seedsman has his own names for certain varieties, and the high-grade seedsman takes pride in selling seeds that satisfy.

Many new varieties of vegetables would better be tried by other persons than the amateur gardener for a few years after their introduction to the public. Standard varieties are likely to be more satisfactory until experience has been gained.

Almost everybody understands that weeds interfere with the growth of vegetables, but many gardeners think that weeds need not be destroyed after a crop has reached or is nearing maturity. A weed should never be allowed to go to seed in a home garden; if it is not killed early, as it should be, pull it up or cut it down before it fills the soil with the certain means of producing more weeds next year. It is surprising how few weeds there will be in a garden where none have been allowed to go to seed in the previous year. And weeds take plant nutriment from the soil, which is not returned to it when the weeds are allowed to grow large but goes back quickly by decay of those that are cut down when small. Weeds, also, after they wither and fall, afford winter quarters for insects

injurious to the garden, and when growing they take water from the soil, often needed by vegetables in a dry season. The weedless garden is necessary to even moderate gardening efficiency, and it is easy to have, with frequent enough cultivation. Only when the weeds become large are they difficult to remove.

Nature's process of soil improvement is to return to the earth most of what is taken from it, each year. We should imitate this process as much as possible. Every stalk, leaf and root that is not edible should be turned into the soil soon after the edible parts have been gathered. When these are allowed to dry up and are then burned, their value as local restorative agents is mostly lost. The most valuable "green manure" for the home garden is the roots and vines of peas, because these, like other leguminous plants, have the power of extracting nitrogen from the air and storing it in their roots, so they make the soil richer for the plants that are to follow them. Peas store nitrogen to a

large degree, and when their vines as well as the roots are allowed to decay in the ground they give to it more than they have taken.

It is easy to cut corn stalks into small pieces, by going along the rows, after the bearing ears have all been plucked, with a grass hook or long knife and clipping 3 or 4 inches at a time until the root is reached. Cut or pull up all other vegetation in the garden, as it becomes useless and while it is still green, and cover it with earth as soon as possible.

Treated in this way and given as careful alternation of crops as the farmer gives his broad fields, the garden soon grows very productive. It will need some stable manure or other fertilizer each year for a time at least, to take the place of edible products removed, especially such vegetables as potatoes, cabbages, onions, beets, carrots and lettuce, of which all or a great part is taken. The gardener should study the rotation of crops; a properly managed garden seldom

needs the planting of any vegetable in the same place it occupied in the previous year. Making the garden pay best is a year-after-year study, not a matter of a single growing season.

Application of pulverized manure or other artificial fertilizers to growing crops, by working it in between rows, is a very effective way of improving the garden. When nitrate of soda is obtainable, it can be very largely and beneficially used for leaf crops. In its absence other fertilizers rich in nitrogen may be used, such as sheep manure, or hen manure, either dry or in the form of liquid manure made by letting the animal product stand for a day or longer in a barrel or tub of water. Liquid manure is wonderfully effective and is not likely to be used too strong if the plant's ability to absorb it is tested by trying it a little at a time.

"How much manure should I use?" is frequently asked. For vegetables of which the leaves are eaten, such as cabbages, spinach, and lettuce, it is almost impossible to use too

much of a fertilizer containing much nitrogen. For vegetables of which the stalks or bulbs are eaten, such as green onions, rhubarb, asparagus and celery, use fertilizers containing a good amount of potash as well as of nitrogen. For vegetables of which the roots or tubers are eaten, such as potatoes, parsnips, beets and turnips, potash is largely needed. For the legumes (peas and beans in the home garden), potash and phosphoric acid chiefly are needed. For the vegetables of which the seeds or seed-containing parts are eaten, such as corn, beans, peas, squash, tomatoes, cucumbers and melons, phosphoric acid is necessary. Both nitrogen and potash are needed for good stalk and leaf development of all plants. It is desirable, therefore, to group vegetables in the garden according to their needs and fertilize accordingly. Here are some of the constituents of good animal manures, as given in Farmers' Bulletin No. 21 of the United States Department of Agriculture: —

	Nitrogen (per cent)	Phosphoric Acid (per cent)	Potash (per cent)
Sheep	0.768	0.391	0.591
Calves	0.497	0.172	0.532
Pigs	0.840	0.390	0.320
Cows	0.426	0.290	0.440
Horses	0.490	0.260	0.480
Hens	0.80 to 2.	0.50 to 2.	0.80 to 0.90

Sheep manure is best used fresh. Horse manure heats and becomes "fanged" when kept long in a pile without being turned over often, and then it is less valuable. In general it is best to use fresh manure on heavy clay soils and well rotted on light soils. Manure used direct injures potatoes and beets and other root crops.

Market gardeners use as much as 30 tons an acre of stable manure in some fields; 6 to 20 tons is commonly used in New England and New Jersey. Much depends, of course, on the natural fertility of the soil or its requirements because of previous use. The limit of practical use on a small plot is about 6 inches depth over the area; a layer about 3 inches deep will give good results, on mod-

erately good soil, for most crops. It is crude practice, however, to apply one fertilizer to every part of the garden. The effects of barnyard manure last fully 20 years, being slowly available in the soil. A fertilizer's action depends on what a plant can readily utilize and some of the commercial fertilizers give much quicker action and results than natural manures. There are several hundred commercial fertilizers, analyses of which are given in manufacturers' statements and in Experiment Station reports.

Every gardener should make use of the nearest public or other library, and should own some of the many books on gardening. From each book he buys he is likely to learn some special thing that will repay its cost. No one book can include everything on gardening. Especially should the gardener become familiar with some of the publications of the Department of Agriculture. This branch of the National Government has issued more than 800 "Farmers' Bulletins" — pamphlets on matters of farm and garden or housekeeping

practice. These are sent free or sold at a small price to persons who write for them to the Secretary of Agriculture or the Superintendent of Documents, Washington, D.C. Many States also have agricultural experiment stations that publish valuable information.

"Sour" or acid soils are usually benefited by the application to them of lime, but there is no ready test by which the amateur may know whether or not his soil is acid. The litmus-paper test, often advised, is not reliable. It is best to seek specific advice on this subject from a state agricultural college or local authority. Lime is used at the rate of about 1,000 pounds to the acre, and is best applied together with "green manure." Unleached wood ashes, for crops needing potash, are used up to 2,000 pounds to the acre. Commercial fertilizers are used in intensive market gardening at the rate of 1,000 to 1,500 pounds to the acre, together with stable or barnyard manure. Soils that do not get enough sunshine are apt to be acid. Most

crops require 5 or 6 hours of sunshine, each day, whenever the sky is clear.

A gardener should commit to memory the fact that an acre is 43,560 square feet and know the area of his garden and of parts of it. If it is rectangular, the area is simply the product of the length by the breadth; if irregular, it can almost always be measured as composed of rectangles and triangles. The area of any triangle is half the product of any side of it multiplied by the distance, at right angles to this side, to the apex of the triangle.

When the gardener can use a hose on his growing vegetables, he should bear in mind that watering ought to be thorough, if resorted to. A sprinkling often does more harm than good. Do not use the hose unless the soil is dry, except on celery, which will benefit from even a sprinkling every day.

In the discussion of vegetables that follows this chapter, an attempt has been made to give sufficient detailed information to enable the home gardener to grow well whatever he wishes to grow. The experienced gardener

may think that too close planting has been advised of some vegetables. But intensive gardening means close planting plus many other changes. That the methods advised are profitable in the home garden has been demonstrated in many years of trial.

In the home garden, cultivated with hand tools only, beds are more profitable than rows, if properly laid out, fertilized and cultivated, for many vegetables. The economical arrangement for the root and bulb plants, especially, — parsnips, onions, beets, carrots, turnips, etc., — and for small top growths, such as head lettuce and celery, is to have the plants in rows that are the same distance apart as the plants are distant from each other in the row, as follows: —

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By thus "staggering" the plants — setting those in each row opposite the space between two plants in the next row — cultivation of every plant in the bed can be in two directions, at an angle of 45 degrees with the side of the bed. This is a great advantage over cultivating only one way as in the case of rows for which the wheel hoe is used. It is easy also to use a hand hoe at this angle. Such a bed should be made as wide as possible, the limit being the distance to which the gardener can easily reach, on the angle, with his hoe. A man of average height can till a bed 6 to 7 feet wide without trouble. The bed should be as long as the garden will permit, for strict economy of space, and several beds of course can be made, with narrow paths between them, say 18 inches wide. Onions and root crops, we have found, can be grown excellently in such a bed, if spaced about 5 inches apart.

Double rows can be used profitably for some vegetables not adapted to the bed system. It is best to grow tall peas in

double rows with brush between the rows, and also dwarf peas. String beans, head lettuce and celery are often grown in double rows.

III

ALPHABETICAL LIST OF VEGETABLES WITH DIRECTIONS

ARTICHOKE. — The true artichoke, often called the globe or French artichoke, is a vegetable whose immature flower heads, the only part eaten, have a relatively high food value. They rank in caloric value above parsnips, onions, beets, squash, carrots, and string beans. But the edible part of the artichoke is small compared with its size, and it is a perennial which produces few heads the first year. Artichokes have never been so popular in the United States as in England and France.

For plants from which heads can be cut the first year the seed should be sown, in the hotbed or housebox, in February or March. Transplant in May to rows 3 feet apart, setting the plants 2 feet apart. In market gardens the rows usually are made 4 to 5 feet

apart, because of the size of the mature plants, which grow 3 to 4 feet high, and the need of space enough for cultivating without injury to the roots. If seeds are sown in the ground, in May or June, good plants for the next year can be had by tieing up the leaves and banking the plants with earth in late autumn. In England it is the custom to remove decayed leaves and stalks and to protect the plants by placing around them about 12 inches of coal ashes or well rotted manure. Artichokes need a rich soil with a good general fertilizer worked into the soil between the rows each year as well as at the time of setting out.

The flower heads are cut when 3 inches or more across, for cooking; smaller heads are used for raw salads or for pickling.

Asparagus. — The cultivation of asparagus can hardly be recommended to those who wish to use a garden space as a means of reducing the cost of living, for the plant, a perennial, occupies much space in propor-

tion to the amount of edible matter which it produces; it should not be cut for food during the first year of its growth even when plants two years old are set out, and its shoots have a low caloric food value, though useful in a well-balanced diet. Furthermore, canned asparagus is good and not expensive and the vegetable is largely raised by market gardeners. When the home garden is permanent, however, and there is room enough for it, asparagus is a very good vegetable to grow, for its fine flavor is quickly lost after the shoots are cut.

Asparagus needs a very rich soil and a bed of it will last many years with liberal fertilizing each year. A sandy loam suits it best, but it will grow well in any ordinary garden soil carefully prepared. After the ground has been heavily fertilized with a good general manure, and worked over to a depth of 2 feet, trenches are dug 6 to 7 inches deep, in which the roots, preferably one year old, are set about 18 inches apart, in early spring. The roots are covered about 2 inches

and the trenches filled gradually as the plants grow. The distance between trenches should be about 3 feet; it is usually made greater by market gardeners and is sometimes made as narrow as 18 inches in home gardens. Between asparagus rows string beans, beets, dwarf peas, radishes, etc., can be grown the first year after setting out. In the second year the shoots can be cut freely. Those who contemplate growing asparagus should read some of the extensive literature by specialists on the subject, before beginning preparation of the bed.

Beans. — In a year of food scarcity no better garden vegetable probably can be grown than beans. The common kinds thrive on poor soil and leave it in good condition for other crops. Fresh beans have a greater food value than any other garden vegetable; dried beans and dried peas, both practically of the same value, are worth as much for food as wheat flour or corn meal, pound for pound, and their caloric value is one

and a quarter times that of porterhouse steak.

Lima beans that require poles need a hot summer to mature, and cannot be planted safely until all danger of frost is over. Dwarf Limas require no poles but are equally sensitive to cold. In growing pole Lima beans the gardener takes risks north of New York, Philadelphia or St. Louis, but if the crop matures it is well worth growing. Nothing is gained by planting Limas before the ground becomes warm, which in the vicinity of Boston or Chicago is not ordinarily before the middle of May. If a very late frost kills the young bean plants, sow more seed immediately or use the land for some other growth. Pole Limas are preferable to dwarf Limas when they have a fair chance of ripening. The wise gardener will grow both for home use, since the dwarf mature earlier and both kinds give a succession for table use.

Where Limas will not mature, the English broad bean, called by seedsmen Broad Wind-

sor, is good. It can be safely planted as soon as the ground is ready to work and has been grown in the cool climate of England for centuries. Broad Windsor beans are very large and of fair flavor, though not equal to the best American pole beans of the kidney type. The vines grow about $2\frac{1}{2}$ feet high and will do better if given brush or a string trellis.

Throughout the greater part of our Northern States the kidney bean — so called from its shape — is the one commonly grown on poles. Seedsmen offer many varieties and their recommendations for different localities and conditions are worth following. These beans, like Limas, cannot be planted safely until the ground is warm. They grow rapidly, twining around poles or strings, and reaching in rich soil a height of 10 feet or more if unchecked, in a hot summer. It is best to pinch back the climbing shoots at the height of the pole; the pods and seeds will mature better.

A bean plot on fairly good soil needs little

fertilization except for Limas, which can hardly have too rich a soil. Setting the poles is the first thing to do in a home garden that is to be spaded rather than plowed. Make holes for the poles, which should be $1\frac{1}{2}$ inch or more in diameter at the base, with a crowbar or by driving a short, pointed stake that can be pulled out without difficulty. The poles should be set 12 to 18 inches into the ground and stand 7 or 8 feet above the ground. After the poles are in place the ground around them for 12 to 18 inches from the pole should be spaded up, the fertilizer, if any is used, mixed with it and the seeds planted. The ground between the poles, which should be about 3 feet apart, may be spaded as the gardener finds time for the work, fertilizer being spread over it early. Plant 4 or 5 seeds around each pole, about 6 inches away from it and 1 to 2 inches deep, firming the soil well over them. Poles can be set after the beans are out of the ground, but this requires much care.

Where poles are not easily obtained,

string trellises can be easily made and the beans planted in rows. Strips of wood 1 inch thick, 2 inches wide and 16 feet long can be bought wherever building material is sold. These make large enough trellis posts when sawed in two and can be used year after year. One such post is needed, set 1 to $1\frac{1}{2}$ feet in the ground and braced, at each end of the trellis, with intermediate posts about every 8 feet. Use two wires, about $\frac{1}{16}$ in. diameter, stretched horizontally between the posts, one at the top and the other at the bottom, to support nearly vertical strings of cotton or other inexpensive material. From a ball the string can be wound rapidly between the two wires, zigzag fashion. Wooden strips or wires are needed rather than strings for the horizontal lines, because strings vary greatly in length as they become wet or dry. Brush is good for beans when high enough, but they naturally climb by twisting round a pole. Dwarf Limas should be planted in rows; some will do better if given brush or a string trellis about 3 feet

high, others do well without support of any kind.

Most dwarf beans are used as string beans; some produce excellent shell beans and are especially good for planting where poles or brush are scarce. String beans are not nearly so nutritious, pound for pound, as the seeds alone of beans that fully mature, but are perhaps as valuable when the weight of the pods holding the mature beans is considered. String beans may be planted in double rows about 6 inches apart, or in single rows 10 to 24 inches apart. They are like pole beans in general needs. Cultivate all beans frequently but not when the vines are wet. Early string beans often may be followed by a crop of something maturing late — celery, for example. String beans are preserved, by salting them liberally, in Europe, but their low food value seems to make this hardly worth while.

Among people of English origin the scarlet runner bean is highly esteemed for food. It is commonly planted in this country as an

ornamental vine because of its fine scarlet, white or pink and white blossoms. It makes a good screen, the vines reaching a height of 8 to 10 feet, and its seeds are of fair quality for eating. The scarlet runner may well be planted wherever a combination of the ornamental and the useful is desired. Seeds should be planted, after the ground has become thoroughly warm, about two inches deep. The scarlet runner will do best in most soils with liberal watering.

Beets. — For home use beets should be grown only in clean soil, to which no stable manure has been applied soon before planting. A fertilizer containing a liberal amount of potash is best. When stable manure is used, spade it into the bed or between the rows. The best way to grow beets on a small area is in a bed about six feet wide and as long as may be needed (see p. 30). Sow the seeds about 1 inch apart, and cover 1 inch. If rows are preferred, make them 10 to 12 inches apart. By the time the beet tops are

6 inches high the plants should have been thinned to 5 inches apart in a bed and about 3 inches apart in rows. Young beets are excellent greens or ingredients of soups and stews. The beet bed is best fertilized in the autumn; it should be planted as early as the ground can be worked, for the first beets to be used. A succession of plantings should be made up to the end of July, at intervals of about two weeks, for beets are best for the table when not fully grown. If they stand in the ground after having attained their full root development, they soon become tough and woody. Beets can be stored for winter use, in pits or cellars where the temperature is not down to freezing, if packed in dry earth or sand. As to food value the beet does not rank high. It is below the parsnip, about the same as the onion, the squash, and the carrot and above the turnip and the cabbage.

Brussels Sprouts. — These are miniature immature heads produced from the sides

of stalks of the plant, which is a variety of cabbage. Cooked in the same way as cauliflower, the sprouts are very palatable and have about the same food value as cabbage. Seeds may be sown about the middle of May or plants bought about June 15, between which date and July 15 they should be set out in land fertilized and cultivated as for cabbage. The plants should stand about two feet apart each way; the heads will be ready for use after the first frosts. Brussels sprouts are easy to grow, but may be classed among the luxuries rather than the necessities of the home garden.

CABBAGE. — This vegetable, though largely used, can hardly be recommended for the home gardener who wishes to make the garden pay and cannot specialize on cabbage. It is largely grown by market gardeners who give their whole time to the work and cultivate on a large scale; it has many insect enemies that must be fought and conquered at the right time, and it is a vegetable that

does not deteriorate appreciably in keeping. Last but not least, the food value of cabbages is low, below that of turnips, string beans, carrots, squash, beets, onions, and parsnips, though there is something in their favor in the large weight of edible matter that each plant produces.

To grow cabbages from seeds, start the seeds at any time between February and July, according to whether early or late cabbages are desired. Started early, they must be planted in the house seed box or a hotbed; after the ground is warm they will do better planted in the ground. Cover seeds about $\frac{1}{2}$ inch. The cabbage grows best in cool weather; it needs abundant moisture as well as coolness, to head properly. Plants are easily transplanted, in about 20 days from the seed sowing; the first setting out should be to a cooler temperature and they should be set about 2 inches apart. By the middle of April, near Boston, they can be set out of doors where they are to head; they are hardy and will stand a temperature as

low as 22 degrees Fahrenheit without injury. Cabbage plants can be bought almost anywhere, ready to set out, at a low price, during the planting season.

The earliest cabbages mature in about 90 days from seed sowing. In a hot summer it is difficult to get good heads. For autumn heads the seed is commonly sown in June. Seedsmen offer different kinds for early and late planting. Late maturing cabbages are stored in trenches, by market gardeners, and keep well until Spring. In a small garden, cabbages may be planted as closely together as 18 inches by 2 feet, if there is a plentiful supply of stable manure, which should be worked into the soil early and used later as a mulch. As the cabbage needs plenty of water, mulching is especially valuable in a dry season. Too much nitrogenous fertilizer can hardly be used.

Carrots. — Home-grown carrots are far superior to the market kind, if pulled young. Full-grown ones are coarser in fiber and some-

times have a woody heart. The best flavor is in carrots that are only about half grown, and these may be had at the same time as early peas from the home garden. Cooked with peas they are especially good on the table.

The carrot has slightly more food value, by weight, than string beans or turnips, and considerably more than cabbages; it has about the same value as beets, squash, and onions and less than parsnips or potatoes. Its salts, however, are valuable in a mixed diet, and it can be stored for winter use in a pit or cellar. Carrots are easy to grow in this respect, that they have hardly any insect enemies.

For home use make several sowings two to four weeks apart, beginning early in April. No fresh manure should be used immediately before sowing seeds; a commercial fertilizer containing potash is desirable, as for other root crops. The soil best for carrots is a loose, sandy loam. If stable manure is the only fertilizer available, spread it early

where the carrots are to go, let it leach into the ground and then remove it to use as a mulch somewhere else, unless the soil is hard, when it may be better to spade in the manure. Carrot seed should be sown in rows 5 to 12 inches apart; the plants can stand very close together for a time, and be thinned as the small ones are wanted for the table. Plant the seeds 1 inch apart, covering them $\frac{1}{2}$ inch, and thin to 2 to 3 inches for cultivation in rows by the time the tops are 6 to 8 inches high; if cultivation is to be in a bed, thin to 5 inches apart as described on p. 30. Carrots maturing in autumn can be stored for winter use, as described under BEETS.

CAULIFLOWER is the aristocrat of the cabbage tribe, with regard to flavor and cultural requirements. Its needs are a large supply of nitrogenous matter in the soil, good drainage, cool weather or shading from excessive sunshine, much water, close cultivation, and protection from insect enemies. Like cabbage it is largely grown for the

market by specialists and in cities can be bought more cheaply than it can be raised by the average home gardener. Its food value is practically that of cabbage, and the weight of the edible portions that can be grown on a given area is less. The successful growing of cauliflower must be learned from experience. But it is a delicious vegetable and, though it keeps fairly well when properly taken care of in the market, is best for the home table when fresh from the garden.

Start the seeds and transplant as directed for cabbage, except that young cauliflower plants must be set out somewhat later or protected on cold nights, as they are sensitive to frosts. By the middle of April they can usually be set in the open ground. For a late crop sow the seeds in the open ground in May or June and set out as cabbages are set, except that cauliflower can stand somewhat closer together, say 18 inches apart each way, or in rows 2 feet apart and with plants 14 to 16 inches apart. When the heads, which are thickened flower clusters, are formed, tie

up the outer leaves around them, with soft twine or raffia; this prevents the heads from becoming discolored.

Celeriac. — This vegetable deserves attention from gardeners who like celery but dislike or have not time for the labor of banking celery for bleaching. Like celery, of which it is a variety, it has no high food value, but celery has a tonic effect desirable for many persons; and celeriac, like celery, can be kept for late autumn and winter use by storage in a cool place with a little water at the roots. This vegetable has long been prized by the Germans. It is eaten raw, used in soups and stews, or boiled and served with a white sauce. Celeriac is a celery that has developed a bulbous root similar to the bulb of a turnip. This bulb, which grows mostly above ground, is the part eaten. Celeriac bulbs should be bleached, by earthing up the plants to a height of four or five inches, when the plants are nearly full grown.

Start the seeds early, either under glass or

in the ground; set the plants in May where they are to mature. They may be cultivated in rows 10 or more inches apart, with the plants about 4 inches apart, or in a bed (see p. 30), the latter method being preferable for the small home garden. They are ready for eating in October. Celeriac is not so good, raw, as celery, but for cooking it is fully as good.

Celery is a vegetable much prized on American tables, but it should not be grown extensively on land that can produce more valuable vegetables, when food is scarce or dear. It needs rich land, and has a food value of only 85 calories per pound, against 145 calories for cabbage, 300 calories for parsnips, and 465 calories for fresh peas. But it can be used as a second crop, to follow fresh peas or string beans; it is one of the few vegetables that keep well through the winter when stored, and its mineral constituents are valuable. A little celery is well worth cultivating; a large amount can be grown with profit if

it occupies ground not otherwise used in the summer and autumn.

Dwarf celery is better for the amateur than the tall or giant kinds, by ordinary methods of cultivation. It requires less labor for bleaching, the plants can be set closer together, and more hearts will be produced. By the bed method (see p. 30) the tall kinds can be grown very profitably for late keeping and the dwarf kinds for early use.

Celery seed should be sown in the open ground, in March or April, in rows about 8 inches apart. The plants will be better if transplanted when about 3 inches high, the tops and roots being sheared to about half their length, and set 2 to 3 inches apart in rows 8 to 12 inches apart. But this is unnecessary, and good plants can be had for a single transplanting into permanent place, which should be in June or the first half of July, by allowing them to grow in the seed bed, clipping the tops occasionally and selecting the strongest plants when the final planting occurs.

It is a good plan to pull up all the seedling plants at once and select the number needed for permanent planting from the largest plants. Shear both tops and roots to about half their original length, throw the plants into a tub of water and take them out as they are needed for planting. It is possible to keep them two or three days this way and have good results in planting, though there is probably no advantage in letting them soak for longer than an hour or two. Set the plants either in rows or beds, preferably on a cloudy day or in the afternoon, and if possible water plentifully the soil when they are in place. In rows the dwarf kinds should be 4 to 5 inches apart and the tall kinds 5 to 6 inches. The rows may be only 18 inches apart if boards are to be used for blanching, but if earth is to be used they should be not less than 3 feet apart, and 4 feet will be needed for the tallest kinds, to permit of banking.

It is undeniable that the finest celery is blanched by being banked with earth. This

gives it a nutty flavor and protects it from frosts. The banking should not begin until October, for warm earth is likely to cause "rust" on the stalks. Banking should be gradual, a few inches every few days, if the celery is for late use; if it is to be used early, the banking can be all done at once. Banking means heaping earth against the plants, on both sides of the row. To do this easily the celery can be held upright by a strip of wood pressed against it and held in place by temporary stakes. Boards, held in place by stakes, are often used to blanch celery and are desirable for that which is to be used early. Thick paper is sometimes used. Anything that will shut out the light from the stalks will do, and a short length of drain pipe, 4 to 6 inches in diameter, is sometimes put on end over each stalk of celery, with excellent results.

Celery for very late use may be blanched by being pulled green and set in a little earth in a frost-proof, cool, dark place. If the roots are kept moist, the celery will grow

slowly and blanch so that even the leaves become white or yellow, in the course of a month or two. For winter use, celery is easily stored, if it is prevented from freezing and the temperature does not become high. To store it, set the roots upright in 2 to 4 inches of earth, packing them thickly together. A trench is best; it should be dug to the full depth of the celery, so that when freezing weather comes the plants can be covered with 3 to 4 inches of earth. For severe weather, manure should be spread on top of the earth cover, but it must be removed when a period of warm weather comes or the celery will spoil. The novice should read some of the many books and pamphlets, on celery raising, that have been published in recent years.

A very large amount of celery can be successfully grown as a late crop on a small area, by the bedding method. The plants, set about 5 inches apart each way, are cultivated until their growth makes further cultivation impossible. The dense mass of tops shuts

out the light from the stalks, so that they blanch without the use of boards or banking. Boards are needed on the sides and ends of the beds only. By this method one of the authors has grown 900 fine stalks of celery in a bed 7 by 21 feet, and the land bore also a first crop of peas. To do this, however, it is necessary to have good land, of mellow soil well drained, and to manure very heavily. Celery requires fertilizers rich in nitrogen and potash. The land may be manured immediately before the plants are set out, and nitrate of soda, when it can be obtained, will do much toward stimulating stalk growth. If the land is well-drained, too much water can hardly be given celery, especially when it is closely planted.

Chervil is one of the herbs most in demand by cooks. The leaves grow to usable size in six to eight weeks; they are used for flavoring soups and salads or for garnishing. Chervil can be sown in spring or autumn, in drills 10 to 12 inches apart. Sow thickly and

cover ½ inch. Thin the plants to 3 to 5 inches, using those pulled out.

Chicory is one of the best of the salad vegetables, and has the point in its favor for home growing that the roots can be stored so as to produce excellent blanched leaves or shoots in early winter. Coffee chicory, so-called because its roots when roasted and ground have long been used as an adulterant and substitute for coffee, should be sown in the open ground in April or May, in drills 16 to 18 inches apart, covering the seeds ½ inch. Thin the plants to about 8 inches apart. The young leaves form excellent "greens" and the inner leaves of the larger plants are used for salads as are also the roots. For winter use, large roots are dug in the autumn and trimmed of all but an inch of their tops; the main root is also shortened to about 6 inches and the side roots are cut off. In a warm, dark cellar or other storage place, spread moist sand or light soil to a depth of an inch or more and on

this lay the roots horizontally, about an inch apart, in a circle. Cover with sand or dirt about an inch and put on another layer. Repeat the process until the pile is as high as desired up to 3 feet high. At the middle of the circle the roots should not quite touch, so that a small hole may be made for watering if the pile gets dry. White shoots will grow from the heads of the tops of the roots. These make a delicious salad material, when about 6 inches long, which is called Barbe du Capucin and may be cut from the pile for several weeks.

Witloof chicory, or French endive, is a variety that can be used like coffee chicory, but also produces tender white or yellow stalks that are eaten raw or cooked when 6 to 12 inches long, in winter, and have a mild, delicate flavor. To grow these, dig the roots in late October or November, trim them to 6 inches, leaving 1 inch of the leaf stems above the roots. Set the trimmed roots perpendicularly in sand or garden loam, about 1 inch apart, cover with 8 inches of light, por-

ous soil and on top of this put 2 to 3 feet of stable manure, well pressed down. In about a month the edible shoots from the root tops may be cut as needed, by pulling away the manure and earth at one end or side of the pile. To grow either leaves or shoots from chicory roots requires a temperature of 50 degrees or more, Fahrenheit, and water enough to prevent the roots from drying, though they are not likely to dry if fresh from the ground when stored.

Chicory should be grown in land neither very rich nor very poor. Do not use fresh manure soon before planting.

Chives are small onion-like plants with narrow leaves that when 3 inches or more high are cut for flavoring soups, stews, etc. The plants grow densely together, 6 to 8 inches high, and can be used as a garden edging or grown in a box. Cut the leaves freely, as they soon grow again. Being a perennial, chives may be taken into the house on the approach of winter. Seedsmen

sell either the seeds or the roots. It is better to buy the roots.

Corn. — Hardly any vegetable is more worth growing in the home garden than corn, whether foodstuffs in general are plentiful or scarce. Green corn has a greater food value per pound of edible matter than any other fresh vegetables except beans and peas. It quickly loses flavor after having been picked, so that market corn is far inferior to that just from the garden. Late-maturing sweet corn can be dried for winter use; when this is properly done and the corn is freshened it is superior to canned corn. By successive plantings and the choice of early, medium, and late kinds, the table can be supplied with an abundance of green corn from early summer until frosts arrive, after which dried corn can be substituted.

Corn needs a rich soil, for best results. Stable, sheep, pig or any other animal manure is useful, and many commercial fertilizers especially for corn growing are in the

market. The droppings from fowls and birds are especially good. Some of the best sweet corn the senior writer has ever seen was grown on a sandy loam that naturally was rather poor, by the use of about ½ pint of hen manure in each hill. For many soils the best fertilizer is barnyard or stable manure, with the addition of ground phosphate rock. Heavy clay or sandy soils are often greatly improved for corn growing by the application of lime (see p. 28).

In loose soil the roots of corn sometimes go 3 to 4 feet deep; hence the desirability of loosening heavy soil as deeply as possible before planting. For the home garden, corn is better planted in rows than in hills. The rows may be as close as 2 feet for the smallest kinds, such as Golden Bantam or Peep-o'-Day; larger kinds, such as Crosby, Stowell's Evergreen, or Country Gentleman, need at least 3 feet. If the soil is rich, 3½ feet apart is a good distance for the larger kinds because of the spread of roots and tops. Seed corn should be covered about 1½ inches deep, and

the stalks thinned, by the time they are 6 inches high, to stand on the average 10 to 12 inches apart. In thinning, the most vigorous stalks should be left.

A corn plot is best manured before any planting is done, but if this is not done the drills can be spaded up, the seed planted, and a white string stretched over each row to mark its place, after which a fertilizer can be spread and spaded in between the rows, as the gardener finds time. This method has the advantage of quickness and convenience in planting, and the spaded ground need not be walked over until the corn is high enough to need cultivating. Sheep manure or commercial fertilizers can be spread between the rows and worked into the soil, in cultivating, very profitably.

Cultivation of corn should be thorough enough to keep down all weeds. If "suckers" — lateral shoots — appear at the base of a stalk, they should be cut off. Artificial watering should seldom be resorted to, for corn rejoices in hot and rather dry weather.

In some localities beans are planted with corn so that the vines may climb on the corn stalks. This practice seems to have little to commend it, considering the different requirements of corn and beans and the possible injury to the corn by the twisting vines.

As to varieties of corn to be grown, every seedsman has his recommendations, but a few kinds have stood the test of time and are popular because of merit, such as Cory and Peep-o'-Day for extra early, Golden Bantam and Black Mexican for medium and Country Gentleman and Stowell's Evergreen for late use. Golden Bantam is a yellow corn, having small ears but of delicious quality; Black Mexican is black or deep purple when ripe, and Country Gentleman has very deep grains with a small cob, finely flavored. Many persons consider Black Mexican the most satisfactory of the standard varieties for eating from the cob, because of its quality, but its color is objected to by others. One of the authors for several years mixed Black

Mexican with medium and late plantings of white corn; the result was corn in the main white but queerly streaked and spotted with purple. It was the most satisfactory, for eating, that ever came to its grower's table.

Several plantings of corn should be made for home use, if quick-maturing kinds are preferred. Golden Bantam and others of the early yellow kind can be planted every two weeks up to the middle of July, for succession. The earliest planting of any kind should not be before the ground is warm.

Cucumber. — There is small nourishment in the cucumber; its food value is very low. The vines take up much room and the vegetable is not an economical one to grow where space is much limited. But hardly any garden product deteriorates in flavor more quickly after being plucked, and cucumbers bought from the market are almost always overgrown. Picked when small, so that the seeds have not fully developed, and not exposed to the sun after being gathered, the

cucumber is a treasure as a salad vegetable. A few vines, under favorable circumstances, will provide enough cucumbers for the amateur gardener's table. This is particularly true if the climbing or Japanese kind is chosen for planting. Japanese cucumbers can be grown on strings or a trellis, against a fence, and their fruit is superior in flavor to that of most ground cucumbers. The Japanese cucumber, also, produces abundantly, needs little water and does best in a dry summer. Every home garden should have the climbing kind if the vegetable is desired at all, whether other cucumbers are grown or not. It is sometimes advised to train the ground kind on strings or a trellis. One of the writers experimented with this method and found it very unsatisfactory. The ground cucumber seems to need contact with the soil for good development of both vines and fruits.

All cucumbers flourish in heat and need a rich soil. Their cultivation should be similar, but the climbing ones have the advantage

that they are not so liable as the ground kind to destruction by insects. Either may well be planted twice, once for early cucumbers and again for late ones. Cucumbers are tender and it is not safe to set or plant them in the open ground until all danger of frost is passed. Early cucumbers may be started in a hotbed or house box, planting the seeds in either old berry boxes or pieces of sod inverted. They cannot be transplanted, but in May their containers should be set out; the roots of those in sod will grow through into the ground, and those in boxes will grow well if the bottoms of the boxes are cut away at the time of planting out. An equally good way to start and set them out is to cut the bottoms off the berry boxes and invert the tapering band of sides remaining, in a large shallow holding box, with a piece of cloth placed under each box so as to cover its base and project about 2 inches on each of two sides of the box. This cloth forms a temporary bottom which can be pulled out when the band with its contents is set in the ground.

Then the band can be lifted out if desired and the plants will be left with a firm mass of earth about them as in the case of pot-grown plants. An inverted flower pot, if the bottom of it could be cut off smoothly, would answer the same purpose.

Cucumber roots spread naturally in all directions and the plants are commonly grown in hills 3 to 6 feet apart, with 4 or 5 plants in each hill. If this method is used, the hills should be heavily supplied with stable manure or a good general fertilizer well-mixed with the soil. Plant 6 to 10 seeds in the hill, cover 1 inch deep, and thin to 4 or 5 by the time the plants are 3 inches high. Cultivation should be frequent until the plants have set their fruit.

Commercial growers usually plant cucumbers in rows, and this method may be followed in the home garden. Prepare the rows like the hills, as regards fertilizer, and plant the seeds 4 or 5 inches apart, thinning, when the plants are about 3 inches high, to 10 to 18 inches apart. Japanese cucumbers, of

course, are planted in a row when along a fence, but they are worth giving a trellis or brush in the open garden. Don't allow any cucumbers to go to seed if an abundance of small ones for the table is desired as long as possible.

Eggplant. — Considering the large quantity of heat that the eggplant requires to bring it to perfection, the abundance of the vegetable in the market, where it keeps well, and the fact that its food value is low, the growing of eggplants in the home garden is not recommended to home gardeners who have but little land to cultivate. Eggplant growing has become a specialty in the South and in glass houses. But for those who choose to have a few eggplants in the garden — half a dozen will suffice for the ordinary family — directions may be given. Good eggplant fruits have been raised in and near Boston, in the open air, given warm soil, a sheltered location, and plants started early.

As the eggplant requires 4 to 5 months'

growth to fruit, the seeds in the North must be started in February or March, in a hot-house. When the young plants begin to show leaves they are set about 2 inches apart, and the better course is to put them in 2-inch pots and shift them gradually until each plant occupies a 5- or 6-inch pot, as they do not stand transplanting well, or to grow them in berry-basket rims (see CUCUMBERS). The best course for the amateur is to buy the plants from a professional grower. In Boston they are for sale about May 15. Being sensitive to frost they cannot be set out earlier. A dry soil is desirable, for the egg-plant does not like much moisture and stands drought well. Use plenty of good stable manure. The plants should be set 18 to 24 inches apart; cultivation should be shallow and frequent. Buy plants of varieties that have been specially developed for Northern open-air growing.

ENDIVE. — This is a good salad plant for the late summer and early autumn. Its

seeds are sown in May or June, about ½ inch deep, in rows about 12 inches apart. Thin the plants, when they are 1 to 3 inches high, to stand 8 to 10 inches apart. The inner leaves are blanched for table use, by tying up the outer ones. Blanching requires 2 to 3 weeks and is begun when the plant is within that time of being fully grown. Endive needs a soil rich in nitrogenous plant food. Its blanching should not be begun all at once, for the blanched heads soon decay if left standing; a few tied up at a time will best supply the table. By sowing the seed in a hotbed and transplanting in April or May endive may be had early, but its chief value is as a late salad when lettuce and other salad vegetables are out of season. Young endive plants are good as "greens."

Herbs need not take up much room in the garden and it is very convenient as well as economical to have a small supply of those most needed, as close to the kitchen door as possible. Their value, of course, is for sea-

soning. Parsley, chervil, and chives have been treated separately; these three are used for the seasoning known to cooks as "fine herbs." Others in common use are anise, sweet basil, caraway, coriander, dill, fennel, mint, sage summer savory, and thyme. A five-cent package of any one of these, except mint, scattered on 2 or 3 square feet of spaded soil or sown in rows, will give a home supply. Mint is most easily grown from a small clump of the plant, obtainable from a seedsman or wherever it is grown. When established mint spreads rapidly and may become a pest.

JERUSALEM ARTICHOKE. — This is properly not an artichoke at all, but a sunflower (*Helianthus tuberosus*) with tuberous roots resembling Dahlia or potato roots. Its flavor is somewhat like that of the true artichoke, hence in part the name. Jerusalem artichokes deserve consideration and experiments by the home gardener. In Europe they are commonly eaten, and in some parts

of the United States they have long been grown as food for swine, which root them up greedily. In rich soil the Jerusalem artichoke grows high and produces large clumps of roots; it has a sunflower blossom. The tubers should be planted like potatoes but as early in the season as possible if the ground is light and porous; they grow best in rich, sandy loam. Plant in rows 2 to 3 feet apart, using a whole tuber every $1\frac{1}{2}$ feet to 2 feet apart, or in hills $2\frac{1}{2}$ to 3 feet apart. They need little cultivation, but should not become choked by weeds. Dig up the roots in the autumn or as desired for food in the summer; they are eaten raw, or boiled or steamed like potatoes, and are relished by many as a side dish, when prepared with cream or milk and butter. Analyses of the tubers show that they have about the same food value as potatoes. Tubers left in the ground produce a crop the next year if the soil is rather light; in cold, wet ground they are likely to rot, and best results are obtained by replanting each spring.

KALE, or BORECOLE, is a kind of cabbage that does not head. Its leaves are eaten, and form an excellent salad material after they have been touched by frost. Young kale plants form excellent "greens" in early spring, but such plants, from seed sown in the open ground in September, or from old shoots left in the ground in autumn, will not make good kale for the succeeding autumn. Dwarf, or Curled Scotch kale, is best for the home garden. For spring use sow the seed in September and protect the plants during winter with a light cover of straw, hay, or leaves. Kale is hardy and will often stand the winter without protection. For autumn use sow the seed in May or June. Cover the seeds ½ inch and thin or transplant the young plants to stand about 2 feet apart each way in the permanent bed. Kale does best in a good, rather heavy soil, on which not much fertilizing material will be necessary.

KOHL-RABI is a member of the cabbage family. It has a turnip-like enlargement of

the stalk, midway between the root and the top of the plant, and does not head. This vegetable is much used in Europe, but in the United States is chiefly grown as cattle food. The food value of kohl-rabi is the same as that of cabbage, per pound of edible matter. It may be boiled and served like cabbage, and the cold boiled vegetable served as a salad. Young kohl-rabi is best; when more than 3 inches in diameter it is usually tough. For home use sow seeds in the open ground in May, covering them $\frac{1}{2}$ inch, in drills 12 to 18 inches apart; thin to 4 to 5 inches apart. Successive sowings should be made, two weeks apart, from the time the ground can be worked until the middle of June if a succession of the vegetables is desired.

Leeks are like onions in flavor, but are milder and have about two thirds the food value of fresh onions. They are hardly worth growing if they can be had inexpensively, as in most city markets, when most wanted as green vegetables, which is in the

winter. Their advantages are that they give a more delicate flavor than onions to soups and stews and can be kept and used as green vegetables throughout the winter. Leeks resemble onions except that they have a thicker stem and only a slight bulbous enlargement.

Seeds of the leek should be sown in rows about 6 inches apart, as early as the ground can be worked in the spring, or earlier in a cold frame, covering them about 1 inch. Transplant, when about 6 inches high, into permanent rows, 6 to 12 inches apart. Set them in miniature trenches 3 to 6 inches deep and earth them up in cultivating, for the purpose of blanching the stalks. In transplanting cut off half their tops and also shorten the roots. For winter use, seeds may be sown in the open ground in May. Leeks may be left in the ground until early winter if the tops are protected from freezing, and pulled as needed. They are usually stored like celery (see CELERY) for the winter, when they are a substitute for young onions. Leeks

need a rich soil and in general are cultivated like onions except for setting deep and banking for bleaching.

Lettuce. — This is our chief salad vegetable in spring and summer. It is easily grown almost anywhere. Though its food value is very low, its mineral constituents are valuable and it makes palatable a simple meal of more nutritious but less attractive foods. That lettuce should be so generally desired indicates that the human body has need of it as a fresh vegetable. And it must be just out of the garden to be truly enjoyed by one who knows the difference between such lettuce and the wilted or tasteless stuff so often sold in the markets. Some food experts consider lettuce a luxury, and such it is if bought or grown when more substantial foods are needed. But a moderate amount of it is highly desirable in a well-balanced diet.

Three kinds of lettuce are valuable in the home garden. Head lettuce is best for spring and early summer use; it too often fails to

head in midsummer to rely upon it for use then exclusively, though varieties that have a greater likelihood of heading are being developed. The lettuce that is sure to give salad material in summer is the leaf kind, not so fine in flavor as the best head lettuce, but crisp and delicate if the inner leaves are used. Cos, or Romaine, lettuce is considered by many the finest of all, when properly grown. The inner leaves of this, which grows so as to form a long, narrow, loose head, are of delicious flavor if they have been blanched and made tender by tying up the loose outer leaves of the plant in its last stage of growth.

For the earliest head lettuce start the seeds in the latter part of February or in March, in a hotbed or cold frame or window box. Sow in drills 4 to 5 inches apart, covering $\frac{1}{2}$ inch. Lettuce is fairly hardy, so it can be set out in March. The plants should not be more than 3 to 4 inches high for transplanting. Set them in rows 9 to 12 inches apart and 5 to 8 inches apart, or in a bed, about 6 inches apart each way. They

need soil rich in nitrogenous matter and nitrate of soda, when it can be had, stimulates them greatly and profitably, if applied in small quantities occasionally. Stable or barnyard manure should be used liberally in preparing the soil.

A succession of head lettuce can be had from seed sown a little at a time, under glass or in the open. But lettuce is a cold-weather plant, and as summer heat comes on the head kind is very likely to shoot up into a tall worthless plant. For summer use it is well to plant leaf lettuce. Give it a rich soil, grow it thickly in a row and if possible a shady location, and the inner leaves will be light-colored and tender, very good for all purposes. Rows of leaf lettuce should be about 10 inches apart.

Cos lettuce, in the opinion of the writers, should be grown for early, midsummer, and autumn use, because of its quality. Start the seeds in rows, under glass or in the open, and set out the plants to stand 5 to 6 inches apart in rows or beds. When they are 6

inches or more high, tie up the leaves of each plant with soft string or raffia so as to make a loose head. The object of this is to blanch and make tender the inner leaves, which are eaten. A succession of Cos lettuce can be had by planting seeds at intervals of about 3 weeks in the seed bed and the soil should be kept moist until the seedlings are transplanted. In the garden also, lettuce needs much water, though the soil should be well drained.

Mushrooms. — It is commonly believed that mushrooms grow best in the dark, but this is true only in certain respects. They can be grown well in the open air, where wild mushrooms flourish. Darkness favors their cultivation because they grow as well in a dark as in a light place, and in darkness there are no weeds to be pulled out. Furthermore, a dark place is likely to have a more even temperature than a light place, and this is favorable to mushroom growth. But a shady corner of the garden, or a small plot so much

shaded that it can be used profitably for nothing else, is frequently a good place for growing these fungi, which are delicious when freshly gathered and properly cooked. Mushrooms can be grown, also, in sheds or cellars. The gardener ambitious to try mushrooms on a large scale should read some of the abundant literature on the subject, by experts. For those who wish to grow only a few mushrooms, simple directions will suffice.

Plenty of horse manure is the first requirement of mushroom growing. The manure heats when in a mass; for the mushroom bed a pile of it is turned over with a fork once a day for a week or longer, until a thermometer thrust into it shows that the temperature has gone down to 90 degrees or a little less. Then the manure is packed in beds or boxes, either in its natural condition or mixed with fine earth, and trodden or pounded down so as to form a dense layer 10 to 12 inches deep. In this broken pieces of the bricks containing mushroom spawn are inserted, 2 to 3 inches deep and 4 to 5 inches apart. Spawn

bricks are sold by seedsmen generally; they are composed of earth and manure and should be broken into pieces about the size of a walnut

About 10 days after the spawn is planted, put 2 inches of fine garden dirt over the maure and pound it with the back of a spade. Then cover the earth with a few inches of hay or straw. The bed needs no more attention until the mushrooms appear, which is usually in about a month, but sometimes is not for four months. If the bed is made in the earth it is not likely to dry out; if in a box, it may seem to require watering, but some mushroom growers say as much harm as good is done by watering. The explanation of this probably is that if the air is so dry as to make watering necessary it is too dry for mushroom growing. Throughout the time that the mushrooms are growing the most favorable temperature of the air is from 55 to 60 degrees Fahrenheit; the more uniform it is, the better will be the result.

Manure for mushrooms should be mixed

with straw, never with sawdust or shavings. After the mushroom crop is exhausted, the manure may profitably be used as a garden mulch. Mushrooms have not a high food value — about that of onions, beets, squash, carrots, and string beans — but they have a higher amount of protein, by weight, than any of these vegetables, and often may be used as a satisfactory substitute for meat. On the strength of analyses now known to have been erroneous, they were once thought to be as valuable for food as beefsteak.

Musk Melon. — This finely flavored vegetable is best grown in market gardens where conditions are more favorable than in the ordinary home garden of our Northern States. Its vines, too, occupy much space, the yield from them is small compared with that from other vegetables, and the food value of the fruits is very small.

As the musk melon needs much heat, its seeds should not be sown out of doors until the ground is warm, in May. It may be

planted in hills or drills, the former being better for the small garden. Make the hills 3 to 5 feet apart and plant 6 to 10 seeds in each, covering about 1 inch deep. When the plants are 1 to 3 inches high, thin to 2 or 3 in a hill. If rows are used, make them 4 to 6 feet apart, and thin the plants to about 18 inches apart. The musk melon needs a warm rather than a rich soil, and much sunshine.

MUSTARD provides excellent "greens." It is at its best early in the spring and is one of the salad vegetables that lose flavor quickly after having been gathered from the garden. For summer use it may often be grown satisfactorily in a shady place, with plenty of moisture. For autumn it should be sown in the summer. With care it will furnish young leaves continuously from early April to late October. Sow the seeds as soon as the ground can be worked, in drills, 4 to 6 inches apart, and cover $\frac{1}{2}$ inch. The young plants, when 2 to 3 inches high, should be cut for salad, in each alternate row. Thin the rows re-

maining, so that the plants stand about 6 inches apart. For "greens," cut plants under 6 inches high. Mustard does best in a rich soil.

Okra, or Gumbo, is a plant that grows better in the South than the North and is much used by Southern cooks for flavoring soups and stews. It deserves to be better known in the North, for it can be grown in the vicinity of Boston and Chicago. Though maturing late, its food value is high, it is one of the vegetables that should be used fresh from the garden, and it produces well for the space occupied by it in the garden. The pods, which are the edible part of okra, should be gathered when they are young and tender; if they are plucked in that stage, the plants will bear pods until killed by frost. Only the dwarf kind of okra should be planted in Northern gardens.

Okra is not easily transplanted; its seeds are best sown in the open ground, in May. Plant seeds of the dwarf kind 2 inches apart,

in rows 3 to 4 feet apart, for the home garden. The soil should have a good general fertilizer well worked into it before planting. Cover the seeds about 1 inch; when the plants are 2 inches high, thin them to stand about 18 inches apart. The plants will be earlier if started in small pots in the hotbed, the cold frame or the window box, and gradually shifted so that they are in 5- or 6-inch pots by the time they are ready to set out, or in berry boxes. A half dozen plants will be enough for the ordinary family.

Onions are the most generally used of the bulbous vegetables grown in the ordinary home garden. Considered alone, onions have not a high food value; by weight when fresh they rank below parsnips, artichokes, and potatoes, not to mention peas and beans. But as flavoring material they enter into the composition of very many compounds of food; they can be stored and kept easily through the winter, and a large weight of them can be grown on a given area. The

onion is highly desirable for growing in the home garden, in sufficient quantity to supply the family's needs for the winter, as well as to provide green onions from early spring until the bulbs for autumn and winter use are harvested.

For early green onions, sets rather than seed should be planted. These are little onions, one half to three quarters of an inch in diameter, which have been grown from seed for the purpose of planting again. Sets may be bought from seedsmen and planted as early as the ground can be worked. For green onions alone they can be set in rows as close together as 1 inch, with the rows 5 to 12 inches apart. Some gardeners plant sets as deep as 4 inches; others prefer to put them almost at the surface. Our preference is for about 2 inches over the top of the bulb in light and 1 inch in heavy soils. After the trench in which sets are planted has been closed with the hoe or rake, it is well to firm the soil by walking over the row. Hardly a set will fail to become a vigorous plant if this

is done. Be careful to put each set in the earth with the root end down.

With a small area to devote to onions, it is a good practice to grow them from both sets and seed, in beds (as described on p. 30), making the rows about 5 inches apart, planting thickly and obtaining young onions for the table by thinning out to 5 inches between the plants that are to be left to grow to maturity.

Onion seed can be sown very early, for the plant is hardy. Some growers of green onions, indeed, in the North, plant their seed in the autumn for a spring crop. The amateur will gain little by this method, nor will it ordinarily be worth his while to start onions from seed sown in the window box under glass. Better onions can be obtained by transplanting them once, without doubt, and the highest efficiency in onion-growing demands this. Even to sow them in the open ground and then to transplant, after shearing tops and roots to about half their length, when the plants are 2 to 4 inches high, means an im-

provement, but it takes much time to do this.

Whether the onions are to be transplanted or not, sow the seed in drills 5 to 12 inches apart, for cultivation by hand tools. Cover about ½ inch and firm the soil by walking over the row. A combination of the transplanting with the non-transplanting method may be made by thus planting and using the seedlings pulled up in thinning for setting in a new bed. If they are to be left in the rows, they may stand, for growing to maturity, about the distance apart that the ripened bulbs will average in diameter. Some kinds, of course, are larger than others.

Cultivation of the plants, both ways, is the one great advantage of the method of planting in beds so as to have diagonal lines in which to use a narrow hoe. This method is especially suited to onions; there will be no weeds between the bulbs that cannot be removed by the hoe, and the soil will be well and easily worked. If a wheel hoe is used on a large plot, rows, as long as possible,

will be most economical, and should be at least 10 inches apart.

Onions are ready for drying and storing as soon as their tops turn yellow and die down. Then the bulbs should be pulled and left on the ground until thoroughly dried, which will ordinarily take about a week. The drying will be hastened and it will be better for the bulbs if they are turned over two or three times while drying. Light-colored onions should be gathered into piles and shaded from the sun, if that is powerful, a day or two after being pulled, as they are likely otherwise to become discolored. When the onions are thoroughly dried, gather them in baskets or crates, twist or cut off part of the tops but leave the roots intact, and store the bulbs in a dry, well-ventilated place, spreading them out on a floor or in bins. They should be kept in the dark and as cool as possible without letting them freeze.

Onions will grow on almost any land, but probably best in a sandy loam containing some clay or with a clay substratum. The

land cannot be given too much well-rotted manure or finely divided commercial fertilizer specially prepared for onions, if the fertilizing material is applied in the autumn before the crop is started and well worked into the soil. Fresh manure is often injurious to onions, and the bulbs should not come in contact with it at any stage of their growth.

For use as green onions, "multipliers" or potato onions are good. These may be planted as sets or seeds and will produce clusters of small onions in bulbs. "Multipliers" are very hardy and will live in the ground through the winter; they are often planted in the autumn and relied upon to produce the first green onions in the spring. Shallots are a kind of small onion planted in the early spring; the leaves as well as the bulbs are used for flavoring.

The average onion crop per acre in the United States, according to Farmers' Bulletin No. 354 of the Department of Agriculture, is 300 bushels per acre. Cultivated by ordinary farm methods, therefore, about 6

bushels could be produced on one-fiftieth of an acre, or a space about 30 feet square. The average family probably does not consume 6 bushels a year. When onions are high-priced it would seem possible and profitable for many gardeners to grow all they need.

PARSLEY. — This is used for seasoning. The leaves are valuable for flavoring soups and stews and for garnishing meat or fish dishes. A very little parsley will suffice the ordinary home garden, and the best way to grow it is in a box that can be taken into the house on the approach of cold weather, so as to keep the plants green and usable throughout the winter. When grown for the market, parsley is raised from seed sown in the open ground as soon as that is workable, or from plants started in a hothouse and transplanted. Sow the seed about $\frac{1}{4}$ inch deep and keep the ground moist. The plant is attractive in appearance, and a window box of parsley is desirable wherever garden space is valuable.

Parsnip. — The root of the parsnip has more food value than any of its relatives commonly grown in the home garden — beets, carrots, turnips, and onions. This is because it contains less water and more carbohydrates than any of the others. It ranks below artichokes, potatoes, corn, fresh peas, and fresh beans only of the common vegetables, in food value per pound of edible matter. The parsnip can be left in the ground all winter with improvement to its flavor. If a bed of the roots is covered with hay or straw they can be dug in the winter, or they can be stored in sand or earth, in a pit or cellar. But as frost improves the parsnip, it is best to leave it in the open ground until that freezes an inch or two and then cover lightly the bed or row, so as to keep the roots accessible from time to time as they are needed. Parsnips are excellent not only in soups and stews and as boiled vegetables, but also when baked or fried.

Plant parsnip seed in the open ground as soon as that can be worked. Cover the seed

about ½ inch; sow about 1 inch apart and thin to 3 inches apart, if rows are used; if in beds, make uniformly about 5 inches apart (see p. 30). The rows, if cultivated by hand, may be as close together as 8 inches; if cultivation is by wheel hoe, make them 10 inches or more apart. Parsnips need a rich, clean soil rather light in texture. Good seed are very important, as they quickly lose vitality. Parsnips have the disadvantage of occupying the ground from early spring until late autumn. Roots not dug up by spring should then be dug, as the plants produce seed in the second season and become a troublesome weed. It is said, also, that wild parsnips from cultivated stock have a poisonous root. Parsnips should not be grown in contact with fresh manure; it is better to fertilize thoroughly the ground for them in the preceding autumn.

Peas are undoubtedly the most delicious of all the vegetables commonly eaten green, when fresh picked. The writers have never

found any canned or dried peas that approached in flavor peas taken immediately from the garden to the table. Peas should be largely grown in the home garden; what are not used as green vegetables can be dried for autumn and winter use, and the best dried peas are equal if not superior to the best canned peas. Dried peas and dried beans have a very high food value and are easily kept through the winter. The food value of green peas is practically the same as that of green corn and is surpassed only by that of Lima and kidney beans. When food is high-priced or scarce the home gardener should grow largely peas and beans.

Since peas develop best in cool weather, part of the home supply should be planted as soon as the ground can be worked, in late February or March. Only the smooth-seeded peas are suitable for very early planting. They are not of so fine flavor as the wrinkled-seeded kinds, which may be planted after the ground has become fairly warm, in late April and May, or in July or early Au-

gust for a late crop. Cover the seeds about 2 inches.

The soil for peas should not be very rich in nitrogenous matter, for if it is the plants will run too much to vine and have too few pods. Peas have the property common to leguminous plants of extracting nitrogen from the air in the soil and storing it in nodules on the roots. They leave the soil richer than it was before they were planted, and so early peas may very profitably be followed by some crop needing nitrogen, as celery, late cabbage or lettuce. When peas have ceased to produce pods the vines and roots should be immediately covered with earth; they will thus furnish valuable "green manure" to the soil. If this is done, the space between pea rows may be planted with new rows of some other vegetable that will profit from the decaying pea vines and roots.

Dwarf peas are best when it is difficult to get brush or inconvenient to construct string trellises (as described under BEANS). But tall peas will produce more pods on a given

space, and many of the so-called dwarf kinds do better for being given brush, since in its wild state the pea is a natural climber. A combination of dwarf and tall kinds is best for the garden, and a selection should be made of early and late kinds, so as to have a succession for the table, as long as possible.

It is best to plant both dwarf and tall peas in double rows, about 6 inches apart. The space between the rows can be cultivated when the peas are young, and brush or a trellis can later be put in it. Climbing peas, where the soil is not too rich, grow $2\frac{1}{2}$ to 4 feet high; they climb by means of tendrils instead of twisting, and horizontal strings can be used for them as well as vertical strings, though brush seems to suit them better, probably because on it they spread out more widely. Pea brush, the amateur may be advised, should be cut in the autumn, winter, or very early spring, so as to be free from leaves when needed. It should be put in place or a trellis should be constructed, for climbing peas, by the time the vines are

4 inches high; vines that have fallen over from lack of support do not climb well. Either brush or a string trellis is better for a row of peas than wire netting, because of the cost of the netting, the difficulty of putting it in place, and the fact that the wire becomes so hot in the sun sometimes as to injure the vines.

In midsummer peas do well in proportion as the temperature is low and they have plenty of moisture. Artificial watering will do much for them in the home garden in a hot, dry summer. Planting peas of early maturing kinds, in summer for autumn use, is taking a chance on what the weather will be; a crop may or may not be obtained, but it is worth trying when land for the purpose is available.

Edible-podded or "sugar" peas are a kind that are liked by many persons; the pods as well as the seeds of these are cooked and eaten, as string beans are cooked and eaten. They have a high food value and seeds of either dwarf or tall kinds may be bought.

Edible-podded peas have long been grown in Europe; they should be gathered and used when the pods are about half matured. As a variant they are worth growing in the home garden. In this connection it may be well to advise the cooking of ordinary green peas with their pods, using as little water as will suffice for the cooking. The pods can be removed readily from the dish, and boiling them adds to the flavor of the seeds. The liquor from boiled peas should never be thrown away but saved for soups if drained peas are preferred for the table.

Peppers are to be considered rather a luxury than a valuable article of food in the home garden. Sweet green peppers are about as good when bought in the market as when fresh picked, and their food value is not high. As a salad vegetable green peppers are relished by many persons, and they are good when stuffed and baked. Plants may be bought for setting out in May, or may be raised in the hotbed from seed. The pepper is sensitive

to frosts. In the garden the plants need a liberal supply of stable manure or some good general fertilizer and should be set 18 inches to 2 feet apart. If the summer is hot they will mature from seed sown in the open ground in May. Cover the seeds about $\frac{1}{2}$ inch. Peppers are easily raised.

Potatoes. — Under ordinary conditions of food-supply, it is not profitable to raise potatoes in a small home garden or on a vacant plot; they can be bought at a low price in the market and there is no advantage in having them fresh from the garden. But extraordinary conditions make a home supply very desirable, since potatoes are preferred by most people to other vegetables that give the supply of starch needed in a well-balanced mixed diet, and are easily and successfully raised when the potash that they need is contained in the soil or can be artificially supplied. The best source of potash for potato-growing in the home garden, at the time of writing, seems

to be hard-wood ashes, which can be bought of dealers in market gardeners' supplies or may have been saved from a fireplace. Before the outbreak of the great European war, potato-growers used largely potash salts and compounds obtained from Germany.

Potatoes do best in sandy loam, but will grow well in almost any soil that is well drained. Freshly turned sod soil often has enough nutriment in it for successful growing of potatoes without the addition of any fertilizer. The grass side of the turf should be turned downward and the lumps broken up as much as possible. A potato patch is best prepared early in the spring by being fertilized, plowed, disked, and harrowed. When in the home garden the spade and rake take the place of horse-drawn tools, the preparation should be as thorough. The ground should be made loose and fine to a depth of 10 inches if the surface soil is that deep but it is not advisable to loosen the subsoil. If unleached wood ashes can be obtained, they should be applied at the rate of 1000 pounds

to the acre, or $2\frac{1}{2}$ pounds for every 100 square feet. Many artificial fertilizers are made for potatoes, and the home gardener may well consult a reliable dealer in these as to what is available and economical. Potatoes should not be grown in successive years on the same ground, if other land can be had.

On large tracts potatoes are cultivated, by horse-drawn tools, one way. With hand tools they may be cultivated when young both ways, — a decided advantage. For hand cultivation the planting should be in rows, 24 inches apart for the earliest varieties, up to 36 inches apart for the latest varieties. For horse cultivation 30 to 36 inches is allowed. Pieces of large potatoes containing several eyes each, called sets, are usually planted, with the eyes uppermost, 12 to 14 inches apart in drills and covered 3 to 5 inches deep. If seed potatoes are very high-priced, cones may be cut out of them for planting, each cone containing an eye, and the rest of the potato may be used for food. The cones can be planted a few at a time, as potatoes are

consumed by the family. Such sets should be placed closer in the rows than larger sets — about 10 inches apart. For each 100 feet of row, therefore, about 120 conical sets will be required, or 100 sets consisting of larger parts of a potato. A peck of seed potatoes, as ordinarily planted, will do for 100 feet of row. All potato sets should be spread out in a cool room to dry for a day or two before planting, so that the cut surfaces will become dry.

Potatoes are planted between March 25 and June 15 in our Northern States, the time depending on whether early or late kinds are planted, and on the latitude and the weather. They are sensitive to frost and nothing is gained by planting them very early unless the ground is unusually warm. Cultivation should be frequent and thorough enough to keep down weeds. The practice of hilling up the plants probably originated in wet soils, where it is beneficial, but on well-drained land cultivation should be flat. Any growing tuber that becomes exposed to the sun should be covered at once, for such exposure makes

the potato of green color and poisonous. "Scabby" potatoes are due to a parasitic fungus, the development of which is favored by the use of stable manure, lime, ashes, and some chemicals of an alkaline nature. To guard against "scab" disinfect the seed potatoes by soaking them for two hours before cutting them, in a solution of $\frac{1}{2}$ pint of formalin to 15 gallons of water.

"How many potatoes can I raise on a given area?" is a question that gardeners who have not tried growing the vegetable extensively, as well as novices, often ask. Soils and conditions vary so widely that the yield on farms ranges from 80 to 400 bushels an acre. Over 1000 bushels an acre have been raised. At the rate of only 100 bushels an acre, a piece of land 66 feet square ought to yield 10 bushels, probably enough for the average family's needs for a year.

Pumpkins ordinarily have no place in the home garden, as they are largely grown with field corn, sold at a low price, and keep well

throughout the winter. But it is possible to grow them together with sweet corn and have a number for home storing. The pumpkin has a higher value, for its edible portion, than tomatoes or asparagus, though considerably less than the squash. Drop a pumpkin seed every 3 or 4 feet in planting a row of late corn; the vines will flourish if the soil is good and their fruits will be ready for eating or storing by the time the first frosts come.

Radish. — This vegetable is often said to be worth little or nothing as food, but analyses show that it has practically as much caloric value as cauliflower, or the edible part of egg-plant or pumpkin, while it has about 30 per cent more than the tomato and 60 per cent more than celery. The radish carries also about as much mineral matter as the beet, the carrot, or the turnip, and such matter from vegetables is needed by the human system. Radishes are worth growing in any home garden, large or small. They can be put in almost anywhere; no fixed place for them

need be considered in planning the garden, for they grow to maturity in 20 to 30 days and rows of them can be used to mark places where slower growing seeds are planted. The more rapidly this vegetable can be grown the better it is; radishes that do not quickly develop are tough and woody.

Plant radishes in rows, dropping the seeds about 1 inch apart and cover $\frac{1}{4}$ to $\frac{1}{2}$ inch; if a bed is desired, make the rows 5 to 12 inches apart. Cultivate lightly from the time they are 1 inch high, and give them plenty of water if the soil becomes dry. For succession radishes should be sown about every 3 weeks; in summer a shady place is better for them than a sunny one. Winter radishes are sown in July to September for storing as soon as they are mature. They are an excellent addition to the winter supply. Radishes need a fine, loose soil. Wood ashes sprinkled over the soil, just after planting the seed, will furnish an excellent fertilizer for the radishes, though in good soil none is needed.

Rhubarb is a popular vegetable and a useful one, despite its low caloric food value; its acid quality helps to make and to keep the body healthy. A half-dozen roots of rhubarb in a corner of the garden will furnish stalks enough for the ordinary family year after year, for the plant is a perennial and is propagated best by division of the roots. Set out the roots in spring or autumn, to have a supply that can be used in the following spring. Rhubarb needs a rich soil and a sunny location; stable manure worked into the soil between the plants will cause it to flourish. Do not pull any stalks the first year after setting out the roots, which should be placed in loose soil with their tops at or near the surface. Keep the plant from going to seed, by pulling out the seed stalks.

Salsify. — This vegetable's flavor when cooked causes it to be called "oyster plant." Like parsnips, its roots are improved by remaining in the ground all winter. It is as valuable as the parsnip and ought to be more

generally cultivated, though in the North its development requires a whole season. The seeds may be sown as early as the ground can be worked, in drills 10 to 12 inches apart; thin the plants to stand 2 to 3 inches apart. Seeds should be covered about $\frac{1}{2}$ inch. The ground should be of loose texture and no fresh manure should be used next the roots. Protect and store salsify through the winter like parsnips. Salsify is usually to be had in city markets, like parsnips, at low cost.

Spinach is not a profitable vegetable to grow in the home garden in any large quantity, as it can be bought at almost all seasons in the open market, and does not deteriorate quickly after cutting. Its food value is low, but its mineral constituent part is large and valuable and it has value as a mild laxative. Spring spinach can be followed by other vegetables. For spring use the seed is sown in August or September; the half-hardy plant is protected lightly by hay or leaves in winter. In summer spinach shoots up and be-

comes coarse. For autumn use seed is generally sown in May. Seedsmen now offer spinach which is said to be good for summer use, the seeds of which are sown early in the spring. For the small garden, Swiss chard (*q. v.*) is better than spinach, in the opinion of the authors. Spinach requires a rich soil, the richer the better; the best fertilizer is stable or sheep manure. Sow the seed thickly in rows 10 to 12 inches apart, covering 1 inch.

Squash. — Unlike its watery cousin, the cucumber, the garden squash has a medium place for food value among the garden vegetables. It ranks about the same as the beet and the carrot, and above string beans and turnips. But the squash occupies much room in the garden, and as it keeps well when sent to market, it is better suited to the farm than the city or suburban garden. When all vegetables are high-priced, however, some gardeners may choose to grow it even in small gardens.

The squash loves heat and its seeds should not be sown out of doors until the ground is

warm. They can be started early under glass, in berry boxes or inverted sods, but that is hardly worth while. Give the squash bed as much manure as possible and plant the seeds in hills. Bush squashes run little and for them the hills can be made about 4 feet apart. Plant 6 to 10 seeds in a hill, cover them about an inch, and thin to 3 or 4 plants. Cultivate so as to have no weeds in the bed. Young squashes are the best for home use. Fall and winter squashes should be planted in hills 6 to 8 feet apart according to the size of the fruits, which indicates the vigor of the vines. Some of the most vigorous run, in rich soil, 15 to 20 feet. The fall and winter squashes, of which the Hubbard is a type, have hard shells and keep well until Christmas or later if stored in a dry room where the temperature does not go below 20 degrees Fahrenheit, and the shell has no cracks or bruises. One point in favor of the winter squashes is the size of their products; Hubbard squashes often weigh 15 to 20 pounds and mammoth squashes have been exhibited

weighing 200 to 300 pounds. A well-kept winter squash makes a valuable addition to the food supply.

Swiss Chard. — This is a beet that produces tops instead of roots. The tops when young make very satisfactory "greens" and can be cut again and again for this purpose, a new growth forming quickly. If the tops are allowed to grow large, the stalks can be used as a substitute for asparagus and are excellent in flavor. In the opinion of the authors Swiss chard is superior to spinach as a home-garden vegetable; it is usable as "greens" throughout the summer and is easily prepared for the table, whereas the satisfactory washing of spinach is difficult and tedious. Plant Swiss chard early or late, in rows about 10 inches apart. Sow the seeds 1 inch deep and about 1 inch apart; thin to 4 or 5 inches if large stalks are desired, using the young growth for greens. Swiss chard, being a leaf crop, needs rich soil; any good general fertilizer may be used.

TOMATO. — Everybody who cultivates a garden likes to raise tomatoes, even though he knows he can ordinarily buy the ripe fruit in the market, at almost any time of the year, of excellent quality and at so low a price as to make the time spent in tomato cultivation seem unprofitable. It does n't pay to raise tomatoes, in the financial sense, when more valuable vegetables can be raised, but there is much satisfaction in seeing a fine crop on the home vines and a certain pleasure attaches to eating tomatoes fresh from the garden. In chemical analyses the tomato's value appears low; a pound of fresh tomatoes as food has only about as much caloric value as a pound of rhubarb and less than a pound of radishes or cabbage. But their acid is enjoyable and useful, and as tomatoes are easily grown, they doubtless will always be a favorite vegetable with amateur gardeners.

Tomato plants are sold very generally in May, at a low price, and the home gardener will usually find it better to buy than to raise

young plants. He can raise them, however, with little trouble, in a hotbed, cold frame, or window box. The easiest way, for a few plants, is to sow the seeds at random in a box and thin out the resulting plants to stand 2 to 3 inches apart by the time they are 3 inches high. This permits leaving the strongest plants for the garden. Sow the seeds about 1 inch apart and cover them about $\frac{1}{2}$ inch, with fine soil. The seed box should be started in late February or March. Tomatoes transplant readily, but some growers hold that they should not be checked at all in their growth and that for early starting their growing in pots is the only commendable method. This theory seems borne out by the experience of one of the writers with tomato plants grown in the open from seed accidentally sown. Such plants in several seasons equaled or surpassed plants started early under glass and transplanted, and similar experience is recorded for other gardeners.

An excellent way to start tomatoes is in

home-made cylindrical pots or collars, made of thick paper bent into a circular band, about 3 inches high and 2 inches in diameter, each band being open at the bottom as at the top and the seam held together by three common pins. Make a few more of these bands than you desire plants, fill them with sifted potting earth and stand them on end, closely packed together, in a shallow box. In the middle of each, with a pencil or small stick, punch a tomato seed about $\frac{1}{2}$ inch into the dirt and then smooth and press down the top slightly with a finger. With good seed and proper care the result will be a number of plants that can be set in the ground without the slightest check to their growth. The paper holds them in shape long enough to get them into the ground, and then decays rapidly. These temporary pots can be used for many other plants whose roots are sensitive to transplanting.

In the small garden tomato plants should be set about 18 inches apart, in rows $2\frac{1}{2}$ to 3 feet apart. Either of these ways will give

excellent results: build for them a little trellis of laths or similar light material and prune the vines greatly after training them on this, so as to expose the fruits fully to the sun, or train each plant up a stake about 5 feet high, pinching out all side shoots as they appear so that only one or two vertical shoots with their leaf growth remain. By the latter method clusters of fruit will be formed at the joints, of superior quality. Whichever method is adopted — and one has seemed to the senior author about as good as the other in practice — the stakes or laths should be driven early, so as not to disturb the roots of the plants.

By keeping down the number of fruits on each plant, whatever the method of growing, their size and quality will be improved. Tomato-vine supports, of wire or wood or a combination of materials, can be bought, and the best of them are very good. But they are expensive and all except the folding kind are bulky to store. Lath supports or stakes seem better. One-inch by 2-inch

strips make very good single tomato stakes, driven 1 foot to 1½ feet in the ground. They will be much neater if of uniform height and painted or stained. It is economical to paint or stain garden stakes, as this preserves the wood and distinguishes them when they are stored. Good garden stakes should be pulled up as soon as the season is over; they can be used many years.

Commercial growers give no supports to tomato plants as a rule. Tomatoes can be grown in this way in the home garden, though not so satisfactorily as with stakes. The plants will bear more liberally for being pinched or cut back greatly, from time to time. A succession of tomatoes should be planted for home use, of early, medium, and late varieties. Very early tomatoes can be followed by celery, or some other late-maturing vegetables; the tomato plants need not be removed until they have fully finished bearing.

Tomato land should be rich in nitrogen, potash, and phosphoric acid. A good stable

or barnyard manure is probably the best fertilizer. It should be well worked into the soil around the plants, either before or after they are set out.

Turnips have less food value than parsnips, carrots, or beets, and contain also less mineral matter than these other root vegetables. Except for their flavor they seem superfluous in the small home garden devoted strictly to utility. But a question of what shall be grown is often mostly a question of flavor, and there are those who are very fond of this vegetable. A few turnips are useful for giving variety to the food of the ordinary household, and they are easily kept in storage for the winter.

The turnip is very hardy; its seeds may be sown as early in the spring as the ground can be worked. If the plants are grown in rows, make these 8 to 12 inches apart and cover the seeds about ½ inch. Thin the plants to 3 inches apart by the time they are 4 or 5 inches high. Young plants and roots may be

used as greens. Cultivate enough to keep down all weeds. Turnips are most economically grown in beds, in a home garden, about 5 inches apart each way (see p. 30). For a late crop the seed is commonly sown in July or the first half of August — sometimes as late as September 10 with success. Turnips are a good second crop to follow early peas or string beans.

IV

INSECT ENEMIES AND DISEASES

Insects

Conservative authorities estimate that considerably over ten per cent of the agricultural production of the United States is destroyed each year by insect pests. As a rule this loss is less in the case of the staple crops such as corn, wheat, tobacco, and potatoes, and much greater in the case of truck crops like cabbage, onions, squashes, cucumbers, etc. It will be seen, therefore, that the small garden must suffer from the depredations of insects, both through the actual destruction of food material and through the loss of much additional material rendered unfit for food by rapid decay due to the presence of insects.

An enormous number of kinds of insects feed exclusively upon plants, and every agri-

cultural plant is affected by a series of insect pests. Of the commonly grown vegetables, each has its own enemies, some of far greater importance than others as they appear more regularly and in greater numbers. In some cases, especially where several vegetables are closely related, we find that they have insect enemies in common. Thus squashes, melons, cucumbers, and pumpkins, all belonging to a small natural group of plants, are affected in common by several destructive insects. On the other hand a wide variety of garden plants suffer injury by certain general feeders like the cutworms, which attack many different plants with almost equal readiness.

There are several reasons for the continually increasing destructiveness of insect pests to agricultural crops. Their multiplication is aided indirectly by the farmer who replants from year to year the same crops and furnishes a much more abundant supply of food than could exist under natural conditions. From time to time insect pests are accident-

ally introduced from foreign countries and added to those already present; many of our most destructive insects have become established in this way. Under cultivation plants of the same kind are massed together and furnish ideal conditions for the rapid multiplication of their insect enemies.

These conditions are utterly beyond the control of the agriculturist as an individual, but it is possible for him with very little expert knowledge and small effort successfully to combat most of the common garden pests and greatly to reduce the injury to his crops. On account of the great variety of insects affecting the common garden vegetables, it is not feasible to describe or treat many of them individually without going to great length; but it is possible to group them according to their habits, in such a way that rational control measures can easily be applied in the small garden.

The grouping in the following table is arranged solely from the practical standpoint with the methods of control in view: —

I. Insects feeding upon the Surface of Plants.

A. *Chewing Insects.* Provided with jaws and biting off pieces from the leaves or surface of the stem or fruit.

1. *Leaf-feeding caterpillars.* Long, more or less cylindrical grubs, usually with a color pattern and often hairy or bristly, and with short, fleshy legs (usually about 8 pairs) along the side of the body. Most abundant in midsummer and later.

2. *Cutworms.* Smooth bodied, inconspicuously striped or mottled caterpillars feeding at night at the base of small plants and usually cutting them off close to the ground. Most abundant in the spring.

3. *Beetles.* Usually small or very small, hard-bodied insects, often with a color pattern.

4. *Beetle grubs.* More or less fleshy grubs of small size, with color pattern; sometimes cylindrical, sometimes swollen, with only three pairs of short legs.

B. *Sucking Insects.* Without jaws, but with the mouth parts forming a minute sucking tube like a bee's sting, which is thrust into the leaf or stem.

1. *Plant-lice or Aphids.* Very small, usually wingless, soft-bodied, usually green insects, with the body swollen behind; provided with three pairs of long legs, very

slow moving. Commonest on succulent plants in moist weather.

2. *Scale Insects.* Small scale-like or pustule-shaped insects without apparent legs and not able to move about. Usually occurring only on woody plants.

II. Insects feeding in the Tissues of Plants.

1. *Leaf-miners.* Very small grubs or maggots which eat out the tissue of the leaf without destroying the surface skin on either side of the leaf, and produce snake-like, irregular or oval, more or less transparent areas.[1]
2. *Stem-borers.* Insects excavating burrows in the stems, not usually noticed till they cause the plant to break off or wilt above the burrow. These are usually whitish caterpillars or grubs.
3. *Root-borers.* Grubs of variable size and shape which burrow in the roots; usually not noticed, as they only weaken the plant and retard its growth.
4. *Root-maggots.* Maggot-like, slender grubs, narrowed to a point at one end, feeding usually in root-crops in which they excavate irregular burrows.
5. *Root-lice or Root Aphids.* Insects like plant-lice, but occurring on the roots, usually in masses and often covered with a whitish, fluffy material; causing the plant to become stunted or even to wilt.

[1] Certain parasitic fungi on leaves (see page 134) produce discolored areas, but these areas are not translucent, as the internal part of the leaf is not eaten away.

Some of the kinds of insects enumerated above are much more easily dealt with than others, and it is necessary to apply different methods for most of them. It is advisable therefore first to make sure what sort is causing the injury.

For the insects feeding on the surface of the leaves, those which actually eat out pieces of the leaves, such as leaf-caterpillars, beetle grubs, and beetles, an arsenical spray applied to the plants is most satisfactory. This is eaten by the insects as they feed upon the leaves and acts as a stomach poison. For this purpose lead arsenate is the most reliable.[1] It should be mixed with water and sprayed upon the plants by means of a small spray-pump. For ordinary garden use such pumps of about a quart capacity may be obtained from dealers for less than a dol-

[1] Paris green was for many years in general use for this purpose, but it has been supplanted by lead arsenate. The latter has many advantages: it does not contain enough soluble arsenic to injure foliage, it adheres better to the leaves, and on account of its white color, one can easily see how thoroughly and uniformly it has been applied.

lar. The following spray is most satisfactory: —

Water	1 quart
Lead arsenate[1] (paste)	1 teaspoonful

To be well mixed and strained through thin cheesecloth. This will not scorch the leaves and should be put on in sufficient quantity to give the leaves a distinct white tinge or white speckled appearance. After a heavy rain or after new growth has appeared, it is necessary to repeat the spraying if the insects are still present.

Cutworms are not affected by such sprays, since they cut directly through the stalk of the young plant and would cause much damage before they could be poisoned by the small amount of arsenate of lead that could be sprayed on the stems. They may, however, be more or less successfully attracted to a poisoned bait made as follows and sprinkled broadcast among the young plants: —

[1] In small quantities this may be purchased for about 25 cents per pound.

Bran ..... 1 pound
Paris green ..... 1 teaspoonful
Molasses ..... 1 or 2 ounces
A quarter orange with the peel, finely chopped and mashed.

To be mixed with sufficient water to make a paste.

A few small boards pressed into the surface of the soil will often attract the cutworms, as they like to hide under such objects, and they may be found by turning the boards over in the daytime. Digging in the soil about the base of a cut-off plant will often disclose one also, hiding during the day.

Sucking insects like plant-lice are more difficult to combat, since they do not feed upon the surface tissue of the plant. They pierce the plant by means of their minute beak, to withdraw the plant juices and sap. Poison sprayed on plants does not penetrate into the plant tissue and the plant-lice are consequently not affected by lead arsenate or other poisons. To deal with such insects it is necessary to apply a contact insecticide, one which kills the insect by contact with its

body. There are several types of such insecticides, any of which may be applied by the same spray-pump as that used for the lead arsenate. It is not advisable to mix the two sprays, however. Three reliable formulas are given below. They should be applied till the plant is covered as by a heavy dew. The nicotine spray is perhaps the best when the material can be obtained; it may usually be purchased from a dealer in seeds or garden supplies.

Contact Insecticides

I

Nicotine spray

"Blackleaf 40" [1] or other nicotine of 40 per cent strength — 1 scant teaspoonful
Water — 1 gallon

I *a*

Homemade substitute

Tobacco leaves and stems — $\frac{1}{4}$ pound
Hot water — 1 gallon
Allow to steep and cool before using.

[1] This material costs in small quantities fifteen or twenty cents per ounce, but is inexpensive on account of the great dilution at which it is used.

II

Kerosene emulsion

Laundry soap ..... $\frac{1}{4}$ pound
Boiling water..... $\frac{1}{2}$ gallon
Kerosene oil..... 1 gallon

Shave the soap and boil in the water till dissolved, then remove far from the fire, add the oil and beat as thoroughly and rapidly as possible till a creamy emulsion forms; store away in a covered jar. *For use dilute one part of the emulsion with ten parts of water.*

III

Soap solution

Laundry soap ..... 5 ounces
Water..... 1 gallon

Shave the soap and boil in part of the water till dissolved; add the rest of the water and apply without further dilution.

Scale insects will not be killed by these sprays, but they will not prove destructive in gardens, except on shrubby plants and orchard trees.

The insects feeding within the tissues of plants are much more difficult to deal with than those treated above, but may be con-

trolled at least to some extent by various special methods.

Leaf-miners are the grubs or preparatory stages of small insects, usually flies, which develop from eggs deposited on or beneath the skin of the leaves of plants. They feed upon the inner portion of the leaf, but do not cut through the leaf-skin on either side, so that they cannot be poisoned by lead arsenate. As they grow they may extend their mines to form gradually widening serpentine burrows, or they may cut a small burrow which is suddenly enlarged to form a large rounded or irregular flat sac. In either case the leaf shows a grayish surface marking and becomes more or less translucent because of the green inner part of the leaf having been eaten away. Frequently by tearing the leaf-skin the maggots may be found, although on becoming full-grown they usually drop to the ground and penetrate the soil before transforming to the adult stage. In the case of plants with thin-skinned leaves, the maggots may be destroyed by spraying with a

contact insecticide, particularly with the nicotine solution mentioned above. This should be applied as soon as the mines appear, in order to catch the maggots before they have completed their rapid growth and entered the ground.

Stem-borers are larger caterpillars or insect grubs developing from eggs placed on or in the tissue of the stems. They are within the stem throughout their growth and cannot be reached by any insecticide. Ordinarily their presence is not noticed till they have so weakened the stem that it breaks, or till they have burrowed out so much of its central portion that the part beyond the injury begins to wilt or fade. A close inspection will often reveal a small opening in the stem, leading to the burrow, through which the excrement of the borer is pushed out. It is then sometimes possible to destroy the invader by pushing a flexible wire into the burrow. Usually, however, the injury is done before this time. Plants which can be induced to throw out roots at places along the stem

should be encouraged to do so, since this prevents the destruction of the entire plant above the injury. Melons and squashes may be partially protected in this way. In other cases, like potatoes and tomatoes, the grub should be killed by a wire or be dug out with a knife as soon as possible.

Root-borers and root-worms affect the roots in a similar way and are very difficult to combat. Corn commonly harbors root-worms as borers in the roots and lower parts of the stems. Injury by these may be reduced by hilling soil about the base of the stalks and thus inducing the plant to throw out roots from the lower part of the stem to replace the injured ones lower down. Root-borers are usually caterpillars, and root-worms the grubs of small beetles. They do not usually affect root-crops.

Root-maggots are the young of small flies, with a long, more or less pointed body of extremely small size. A number of them usually occur together in the same root and they most commonly affect root-crops, such

as onions, radishes, carrots, etc., although one is a common pest of cabbage. Root-maggots may sometimes be reached by pouring a small amount of carbolic emulsion about the roots after first making a couple of holes in the soil next the plant by means of a thin stick. An ounce or two is sufficient for a small cabbage plant.

Carbolic emulsion

Laundry soap	$\frac{1}{2}$ pound
Crude carbolic acid	$\frac{1}{4}$ pound
Water	2 quarts

Shave the soap and boil in the water till dissolved, then add the carbolic acid and keep at the boiling point for 20 minutes. For use dilute one part with ten of water.

Cabbage plants may be protected also by a disc of tarred paper fitted about the stem next the ground when they are transplanted. This should be about 6 inches in diameter with a small hole in the center and a slit to the edge so that it may be placed about the stem.

Root-lice or Root-Aphids are subterranean

species similar to the plant-lice and Aphids that occur on the leaves. They cause a weakening of the plant by sapping the juices from the roots which they puncture with their minute beaks. Affected plants are usually small, fail to grow properly and often finally wilt and die. If one is pulled up the Aphids may be seen in clusters on the roots, usually covered with a white, fluffy secretion. Nicotine solution like that recommended for spraying or carbolic emulsion poured in small amounts about the base of the plants is usually an efficacious remedy. Frequently the thinning of plants, *e.g.*, lettuce, eliminates the infested plants.

General Precautions

Insect pests are usually most abundant and destructive in ill-kept gardens, particularly in those that are neglected in the fall after all of the food crops have been harvested. This is due to the fact that nearly all the common garden pests pass the winter, in one stage or another, either in or close by

the plants in which they live during the summer. Many stay in the roots or stems that remain, some enter the soil for hibernation, while others find protection by hiding beneath rubbish which is allowed to remain on the surface of the soil. Such rubbish should be raked into piles, left till cold weather in order to attract as many insects as possible, then burned. A late fall plowing to follow this is advisable as it tends to disturb the insects in the ground by breaking up the cells in which they are resting and exposes them to the alternating freezing and thawing of winter and early spring. Careful attention to this will bear fruit the following season, in a lessened number of destructive insects.

Plant Diseases

Garden plants as well as wild ones are subject to many diseases which are somewhat similar to those of men and other animals, with which we are more familiar. Plant diseases are, as a rule, not due to bacteria like

those of animals, but to parasitic fungi of various kinds. These fungi attack different parts of the plant such as the leaf, root, stem, fruit, etc., and by growing there cause certain malformations or destroy the tissue, thereby injuring the plant, interfering with its growth, or even completely destroying it. They develop from microscopically small spores that gain access to the specific tissue of the particular plants which they affect. Since these spores cannot migrate and are less rapidly disseminated, fungi are usually more sporadic in their occurrence than most insect pests of plants.

Fungi which infest leaves usually cause discolored areas of irregular size and form, sometimes destroying only these spots and again causing a wilting and dying of large amounts of foliage. The most general remedy for fungi of this sort is a compound of lime and copper known as Bordeaux mixture, which is sprayed upon the foliage in the same way that arsenate of lead is applied for insects. This mixture may be purchased

cheaply from any garden supply house, or may be made as follows:—

Bordeaux mixture

Unslaked lime	$\frac{1}{4}$ pound
Copper sulphate (blue vitriol)	$\frac{1}{4}$ pound
Water	3 gallons

Slake the lime in half the water, dissolve the copper sulphate in the remainder and then mix while stirring briskly. Spray on plants without diluting.

It is very important that spraying be done at the first indication of injury, or if a disease is known to have occurred nearby the previous year, just before the time that it may be expected to reappear.

Fungi affecting the roots are less easily dealt with, although in some cases like potato-scab, a treatment of the seed potatoes, before planting, with some germicide such as formaldehyde, is satisfactory. The rotation of crops is practically always essential if disease appears, as many diseases overwinter in the soil where the plants have grown. Diseased plants should be promptly removed and burned.

Certain diseases of the fruit are very destructive but many of them may be partially controlled by picking and burning infected fruits, as they appear. This prevents spreading from plant to plant and also avoids a possible infection of the soil.

Specific Insect Pests and Plant Diseases

The following list of insect pests includes those which are generally most abundant and destructive, although there are many others occurring less commonly, or only sporadically. Any species found which are not mentioned in the list, may be dealt with according to the general directions given on the preceding pages. In such cases one should make sure, however, as accurately as possible, whether the insect is a leaf-feeder, leaf-miner, Aphid, or what not, before attempting to apply a remedy.

For convenience the plants are arranged in alphabetical order, and below the insect pests and diseases are arranged in the same way in each case.

Artichoke

This plant is usually infested by a number of leaf-feeding caterpillars, stem-borers, and root-borers in Europe, but is commonly quite free from pests in the United States and but little damage may be anticipated.

Asparagus

Asparagus beetle. Small orange beetle with blue-black ladder-shaped bands, feeding on shoots in spring; grubs later on leaves. Control: prompt cutting of shoots in spring, leaving a few as lures to be destroyed after eggs are laid on them; spraying with lead arsenate later in season.

Spotted asparagus beetle. Similar, but with black spots. Habits much the same, but grubs feed in berries later in season.

Asparagus miner. A small maggot mining under the skin of stalks. Control: a few volunteer plants left to grow till late June, to be then pulled up and burned.

Fungous disease. Asparagus rust appears

as an early spring discoloration of plants and later produces blister-like spots beneath which are the brown spores. Control: dust the plants, early in the morning when covered with dew, with fine sulphur (flowers of sulphur) and repeat once or twice later in the summer; cut down and burn all plants from an infected plot in the fall.

Beans

Growing bean plants are ordinarily but little affected by insects except in the Southern States.

Seed-corn maggot. This root-maggot occasionally damages germinating beans and very small plants. Control: replanting or treatment as recommended on p. 131.

Cutworms. Control as recommended on p. 124.

Bean weevil. A very small beetle, developing as fleshy grubs in the growing bean and continuing in the harvested dried beans. Affected seed beans show irregular cavities and fine granular powder accumulating in

bottom of the container. Control: weeviled beans should be immersed for one minute in boiling water before planting. Dried beans may be heated in an oven nearly to boiling temperature before storing away for food.

Fungous disease. Anthracnose causes a spotting of plants and pods, developing from spores remaining over winter in the seed beans. Control: spray with Bordeaux mixture when plants are several inches high, repeat after ten days and again after blossoming. Use good seed that is not likely to be infected.

Beets

Flea-beetles. Minute, jumping beetles feeding as adults on the surface of the leaves. Control: lead arsenate spray.

Leaf-beetles. Small beetles and their grubs feeding on the leaves. Control: lead arsenate spray.

Leaf-caterpillars. A common one webs the leaves together. Control: lead arsenate spray.

Beet leaf-miner. Minute maggots feeding in the leaf-tissue. Control: difficult; severe infestations should be treated with nicotine solution.

Root-Aphis. These are abundant in some parts of the West, but not seen in the East. Control: as described on p. 131.

Diseases. A leaf-spot fungus sometimes appears on the leaves, which should then be sprayed with Bordeaux mixture. A scab on the roots of beets is similar to potato-scab, and thought to be the same. It may recur in soil where scab has appeared on beets or potatoes the previous year.

Cabbage

The enemies of cabbage and related plants such as cauliflower and Brussels sprouts are practically the same, and radishes, turnips, kohl-rabi, etc., are attacked by many of the same pests.

Cabbage-worm. This is a velvety green caterpillar almost the exact color of the growing cabbage and gives rise to the common

white cabbage butterfly. It feeds upon the outer loose layers of leaves cutting out irregular pieces. Control: lead arsenate spray applied early, as soon as injury is noted. Cabbages rarely escape this common pest. Sometimes a small patch may be cared for simply by hand-picking of the caterpillars.

Cabbage-looper. A similar mottled green caterpillar which loops the body when crawling; it is the larva of a dull-colored moth. Control: the same as for the preceding species.

Other leaf-feeding caterpillars. Several other species occur quite generally and are controlled in the same way.

Cutworms. These insects cut off cabbages as they do other plants in the spring. In fall also they may do damage, at that time by feeding on the leaves or boring into the heads. Control: see p. 124. In the fall they are controlled by the lead arsenate spray which has been applied for other leaf-feeding pests.

Cabbage Aphis. This is a small green Aphid most abundant on the leaves in damp sea-

sons. Control: see p. 125, for general directions.

Leaf-miners. The maggots of several small flies often mine in cabbage leaves, destroying small irregular patches. Control: spraying is not satisfactory, but in small gardens infested leaves may be cut off and thrown on the hot soil to kill the maggots.

Harlequin cabbage bug. A brightly colored, red and black bug, feeding both as adult and young by piercing the leaves with its needle-like beak. It is restricted to the warmer parts of the country. Control: no insecticide is satisfactory, but as the adults overwinter in rubbish the fall "clean up" described on p. 133, is a preventive.

Cabbage maggot. This is a minute root maggot developing from eggs deposited by a small fly. It occurs either near the surface of the root, or deeper in the tissue or even in the base of the stalk, and is most destructive to young plants. Control: when transplanting any infested plants should be dipped in soap solution (see p. 127). Badly infested

plants may be later pulled out and destroyed and replaced by others. Another method is described on p. 131.

Disease. Brown rot is a disease that affects portions of the head or stalks, causing a brown colored decay. Control: remove infected plants or leaves showing injury and burn. Do not plant cabbage if rot has been present in the plot.

Carrots

Many of the insect enemies of carrots, celery, parsley, and parsnips are the same, and these vegetables should not follow one another in rotation.

Carrot (or *celery*) *caterpillar.* A bright yellowish caterpillar with black bands and spots feeding on the foliage. Control: lead arsenate spray.

Carrot rust-fly. The maggots of a small fly that burrow in the roots, sometimes riddling them with burrows. Control: not ordinarily feasible, except in a general way by clean gardening methods (see p. 132).

Other leaf-feeding caterpillars sometimes appear but are easily controlled by a lead arsenate spray.

Cauliflower

The common insect pests and diseases of cauliflower are the same as those of cabbage, under which plant they have been enumerated. Cauliflower usually suffers less than cabbage from insect injury.

Celery

Celery caterpillar. See above under *Carrot.*

Celery-looper and celery leaf-tyer. Leaf-feeding caterpillars eating the foliage and, in the case of the leaf-tyer, spinning several leaves together. Control: lead arsenate spray.

Carrot rust-fly. This maggot attacks celery also, feeding in both the large and smaller root. Young plants when affected show a browning of the leaves. Control: drenching the soil at the base of plants early in the season with carbolic emulsion is helpful.

Diseases. Several diseases affect celery, one causing leaf-spotting being especially common. Where this occurs, spraying the young plants previous to transplanting with Bordeaux mixture is advisable. Heart-rot appears in plants after banking and is augmented by a too-rapid closing in of the boards.

Corn

Corn ear-worm. A large caterpillar, abundant in the South, but rarer in the Northern States, which feeds inside the shucks of the corn, destroying usually the kernels near the tip of the ear, but sometimes ruining entire ears. The eggs are laid by the parent moth on the silks and generally only one caterpillar reaches the inside of the ear. In localities where it occurs, the white eggs, smaller than a pinhead, may be found on the silk soon after it appears. Earlier in the season the caterpillars of an earlier generation feed in the unopened tassels. Control: powdered arsenate of lead dusted on the silk where

it enters the ear as soon as any eggs are to be seen.

Corn root-worms. Two kinds of small green beetles, one pale green and the other spotted with black. Their grubs feed in the roots. Control: thinning out the weaker plants removes many infested ones, and hilling soil about the base of the stalk when cultivating induces new roots to develop to take the place of the older infested ones.

Corn stalk-borers. Caterpillars that excavate galleries in the stem near the ground. Control: no simple remedial measures except the pulling up and burning of stalks in the fall, as the borers remain in them during the winter.

Cutworms. See p. 124.

Disease. Corn-smut. This usually appears as swollen blackish masses, generally on the ears. These later break open and liberate immense numbers of spores which may remain over winter in the soil or in manure to reinfect corn the next year. The masses should be cut off and burned as soon as noticed and

before they burst. In planting crop rotation should be practiced.

Cucumbers

Cucumber beetle. A small green beetle with three black stripes down the back. Appears early and the adults gnaw into the young plants near the ground partly cutting them off. The larvæ are root-worms, living in the roots, but not causing such noticeable damage as the adults. Control: in a small garden, the planting of a larger number of seeds to a hill is advisable, as the injured seedlings can then be pulled out. An inverted flower pot placed over plants will also protect them, as the beetles disappear by the time the plants attain any considerable size. The adults of the spotted corn root-worms also injure the seedling stalks in the same way.

Melon Aphids. A dark green plant louse, often abundant on cucumbers, as well as on melons, squashes, and pumpkins. Control: any contact insecticide, see p. 126.

Pickle-worm and melon caterpillar. Two

caterpillars, common southward, but rare or absent in the North. They feed to some extent on the foliage and should be combated with a lead arsenate spray.

Squash vine-borer. The caterpillar of a brilliantly colored clear-wing moth which tunnels in the stems of squashes and pumpkins as well as in cucumber vines. Control: remedial measures are difficult, but if the vines are hilled over at intervals and induced to throw off roots at the joints it will prevent an infested vine from dying beyond the injury. This insect hibernates in the soil and thorough fall plowing is beneficial by preventing to some extent its successful overwintering.

Squash-bug. This occasionally attacks cucumbers. See p. 157.

Leaf-feeding beetles. Sometimes leaf-feeding beetle grubs appear, but are easily controlled by an arsenate of lead spray.

Diseases. Cucumber is affected by several leaf-spotting and wilt fungi. Some of these may be checked after appearance by a Bor-

deaux mixture spraying, but if diseases are known to have occurred the previous year, the spraying should forestall their probable appearance.

Eggplant

Flea-beetles. Minute, usually black, jumping beetles that gnaw tiny holes or pits in the leaves. Control: lead arsenate spray.

Leaf-beetle grubs. Occasionally certain beetle grubs occur on eggplant. Control: lead arsenate spray.

Diseases. This plant is not generally affected by diseases. For any that appear, Bordeaux mixture is the most suitable general remedy.

Kohl-rabi

This plant is similar to cabbage and cauliflower and is sometimes affected by the same pests, especially the cabbage-worms and the cabbage Aphis.

Leeks

The various onion pests occur also on leeks. See p. 151.

Lettuce

Lettuce is rather free from insect pests and in small gardens requires but little attention aside from the thinning out of weakened or injured young plants as is ordinarily practiced.

Lettuce root-louse. This is a root-aphid that sometimes occurs in masses on the roots. These aphids appear as a cottony mass, the affected plants wilting as a result of the injury. Control: pulling the affected plants and laying them on the soil to dry out will usually prevent extensive damage.

Diseases. Lettuce is subject to several diseases which are not usually controllable in the ordinary garden except by pulling and burning affected plants or leaves.

Mushrooms

Maggots belonging to several kinds of small flies commonly occur in the stems or caps, where they excavate irregular burrows or cavities. Control: this is difficult in the

case of cellar-grown mushrooms. Those grown in the open are much less generally injured, although they are sometimes injured by cockroaches and small biting insects.

Musk-melons

These plants are affected by the same insects and diseases as cucumbers, squashes, and pumpkins.

Okra

Okra is ordinarily not injured to any extent by insects.

Onions

Onion maggots. The maggots of two small flies, one native and one of European origin, infest the bulbs of onions, burrowing directly into the tissue. Control: this is extremely difficult as the maggots are difficult to reach with any insecticide. Nicotine solution or carbolic emulsion poured in small quantities on the soil at the base of the plants is sometimes, although not always, more or less efficacious. Small onions often

show the injury early by wilting. These should be immediately pulled and burned.

Cutworms. Onions are sometimes, but not often, attacked. Control: poisoned bait, see p. 124.

Parsnips

Many of the insects discussed under carrots and celery occur on parsnips.

Parsnip leaf-miner. These are the maggots of a small fly which mine in the leaf-tissue. Control: cutting off infested leaves and allowing them to dry out on the soil is usually the only treatment necessary.

Parsnip web-worm. Similar to the celery web-worm. Control: lead arsenate spray.

Peas

Pea-weevil. This is the grub of a small beetle that develops in the green pea seed, but does not emerge till the following spring. The infested pea shows no injury when first shelled and the presence of the grub is usually not noticed. Control: since the beetles

emerge from seed peas, these should either be held over for a year till the beetles have left them, or should be placed in boiling water for one minute to kill the contained insects. Such treatment does not prevent the peas from germinating. Seed peas purchased from seedsmen do not require treatment.

Pea Aphis. A green plant louse, especially common in damp seasons. Control: a contact insecticide, see p. 126.

Cutworms. These insects sometimes cut off young pea vines. Control: poisoned bait, see p. 124.

Diseases. Several leaf and pod diseases are common, usually developing from infected seed peas. Anthracnose is one of the most destructive. As with the similar disease of beans, Bordeaux mixture is the most satisfactory remedy.

Potatoes

Colorado potato-beetle. Perhaps our best-known garden pest. A small oval buff-colored black striped beetle. The grubs, swollen

reddish or pinkish yellow, with black markings, feed upon the foliage of the potato. Control: lead arsenate spray applied as soon as the beetle grubs appear. This must be repeated, as there are two or more generations each summer.

Potato stalk-borer. This is the grub of a beetle, mining in the stems of the potato. It causes a weakening of the plant, or when abundant may kill it. Plants which seem to be affected should be pulled out and put in the sun to dry out. The hibernating beetles will be killed by the autumn clean-up recommended on p. 133.

Flea-beetles. Very small jumping beetles that eat out small pits or perforate the leaves. Control: the lead arsenate applied for the Colorado potato-beetle destroys these also.

Blister-beetles. Elongate, soft-bodied, black, or gray, black striped beetles feeding on the foliage. Control: these are also destroyed by the lead arsenate spray.

Diseases. Blight. There are two kinds of leaf-blight commonly affecting potatoes,

one appearing in the early summer and the other later. Bordeaux mixture is satisfactory for both. For early blight, it should be applied when the plants are about 8 inches high and be repeated several times at intervals of two weeks. Spraying for late blight need not be begun till the end of July.

Tuber diseases. The commonest of this type is potato-scab, a fungus the spores of which live over winter in the soil or on the tubers. Control: seed potatoes should be soaked in a weak solution of formaldehyde (one third pint formaldehyde to ten gallons of water) for two hours before planting. They should not be planted in soil where scabby potatoes have been the previous year or even two years before.

Pumpkins

The cucumber beetle and squash vine-borer mentioned under Cucumbers affect pumpkins also. The squash-bug (see p. 157) is very destructive to pumpkins.

Radishes

The cabbage maggot and the cabbage leaf-miner (p. 142) also affect radishes. Control: owing to the quick-maturing nature of radishes it is advisable to pick any infested plants and to destroy them if unfit for food.

Rhubarb

Usually insect pests are rare on this plant and it requires no attention.

Spinach

Flea-beetles, leaf-miners, and occasionally leaf-feeding beetle grubs occur on spinach, but owing to the nature of the crop, spraying, especially with lead arsenate, is inadvisable.

Squash

This plant is so closely related to the cucumber and the pumpkin that it has many of the same insect enemies and diseases, al-

though one destructive insect is perhaps especially abundant on the squash.

Squash-bug. This is a rather large, elongate blackish bug with needle-like piercing mouthparts by means of which it punctures the stems and thicker leaves to feed on the plant juices. It can crawl about rather actively as can also the young, which are gray, with black legs. These insects are apt to occur in groups, especially the young ones. The adults overwinter in the field under rubbish. Control: as the squash-bug is very hard-bodied, contact insecticides have little effect upon it. The adults may be attracted under small boards laid on the ground in the fall and destroyed, and the fall "clean-up" advised on p. 133 will reduce their numbers the following year.

Tomatoes

Cutworms. Newly set tomato plants are often destroyed by cutworms (see p. 124). In a small garden with few plants, it is possible to protect them by a cylinder of tarred

paper (about 4 inches long and 2 inches in diameter) enclosing the stalk and set well into the soil at the base.

Tomato-worm. A large caterpillar that feeds on the foliage. Control: this and other leaf-feeding caterpillars are easily destroyed by a lead arsenate spray.

Stalk-borers. Several caterpillars sometimes occur in the stems, excavating long burrows, weakening the stems and causing them to bend or break off. Control: these may often be killed by a wire or stiff brown straw inserted into the burrow, after which the plants will often recover their vigor.

Tomato fruit-worm. This is the same insect as the corn ear-worm (see p. 145). The caterpillars bore into the green and ripe fruits, causing them to decay rapidly. This insect is destructive in the warmer parts of the country. Control: hand picking is the only feasible remedy, but fall plowing destroys the chrysalids which winter in the soil.

Diseases. The tomato is affected by a number of fungus diseases which occur

on leaves, stalk, and fruit. Spraying with Bordeaux mixture is the most satisfactory general treatment.

Turnips

Turnips have much the same enemies as radishes. They do not ordinarily suffer much from insect injury.

THE END

APPENDIX

TABLE I

FOOD VALUE OF FRESH VEGETABLES AND OTHER FOODS

(From *The Chemical Composition of American Food Materials*, by W. O. Atwater, Ph.D., and A. P. Bryant, M.S. Bulletin No. 28, Revised Edition, United States Department of Agriculture; Office of Experiment Stations.)

Food materials	*Water (per cent)*	*Protein (per cent)*	*Fat (per cent)*	*Total carbohydrates (per cent)*	*Fuel value per lb. Calories*
Artichokes as purchased.....	79.5	2.6	.2	16.7	365
Asparagus, fresh, as purchased	94.0	1.8	.2	3.3	105
Beans, butter, green, edible portion.....	58.9	9.4	.6	29.1	740
Beans, dried, as purchased....	12.6	22.5	1.8	59.6	1,605
Beans, Lima, dried, as purchased.....	10.4	18.1	1.5	65.9	1,625
Beans, Lima, fresh, edible portion.....	68.5	7.1	.7	22.0	570
Beans, string, fresh, edible portion.....	89.2	2.3	.3	7.4	195
Beets, fresh, edible portion....	87.5	1.6	.1	9.7	215
Cabbage, edible portion.....	91.5	1.6	.3	5.6	145
Carrots, fresh, edible portion..	88.2	1.1	.4	9.3	210
Cauliflower, as purchased.....	92.3	1.8	.5	4.7	140
Celery, edible portion.....	94.5	1.1	.1	3.3	85
Corn, green, edible portion....	75.4	3.1	1.1	19.7	470
Cucumbers, edible portion....	95.4	.8	.2	3.1	80
Eggplant, edible portion.....	92.9	1.2	.3	5.1	130

Food materials	*Water (per cent)*	*Protein (per cent)*	*Fat (per cent)*	*Total carbohydrates (per cent)*	*Fuel Value per lb. Calories*
Kohl-rabi, edible portion	91.1	2.0	.1	5.5	145
Leeks, edible portion	91.8	1.2	.5	5.8	150
Lettuce, edible portion	94.7	1.2	.3	2.9	90
Mushrooms, as purchased	88.1	3.5	.4	6.8	210
Muskmelons, edible portion	89.5	.6		9.3	185
Okra, edible portion	90.2	1.6	.2	7.4	175
Onions, fresh, edible portion	87.6	1.6	.3	9.9	225
Parsnips, edible portion	83.0	1.6	.5	13.5	300
Peas, dried, as purchased	9.5	24.6	1.0	62.0	1,655
Peas, green, edible portion	74.6	7.0	.5	16.9	465
Potatoes, raw or fresh	78.3	2.2	.1	18.4	385
Potatoes, sweet, raw or fresh	69.0	1.8	.7	27.4	570
Pumpkins, edible portion	93.1	1.0	.1	5.2	120
Radishes, edible portion	91.8	1.3	.1	5.8	135
Rhubarb, edible portion	94.4	.6	.7	3.6	105
Ruta-bagas, edible portion	88.9	1.3	.2	8.5	190
Spinach, fresh, as purchased	92.3	2.1	.3	3.2	110
Squash, edible portion	88.3	1.4	.5	9.0	215
Tomatoes, fresh, as purchased	94.3	.9	.4	3.9	105
Turnips, edible portion	89.6	1.3	.2	8.1	185
Watermelons, edible portion	92.4	.4	.2	6.7	140

OTHER IMPORTANT FOOD VALUES FOR COMPARISON

Food materials	*Water (per cent)*	*Protein (per cent)*	*Fat (per cent)*	*Total carbohydrates (per cent)*	*Fuel value per lb. Calories*
Beef, fresh, tenderloin	59.2	16.2	24.4		1,330
Mutton, loin, medium fat, without kidney or tallow, edible portion	50 2	16.0	33.1		1,695
Pork, loin (chops), med. fat, edible portion	52.0	16.6	30.1		1,580
Fowls, edible portion	63.7	19.3	16.3		1,045
Halibut, steak, edible portion	75.4	18.6	5.2		565
Salmon, whole, edible portion	64.6	22.0	12.8		950
Oysters, in shell, edible portion	86.9	6.2	1.2	3.7	235
Eggs, hens', uncooked, edible portion	73.7	13.4	10.5		720
Cheese, full cream, as purchased	34.2	25.9	33.7	2.4	1,950
Milk, whole, as purchased	87.0	3.3	4.0	5.0	325
Corn meal, granular	12.5	9.2	1.9	75.4	1,655
Oatmeal	7.3	16.1	7.2	67.5	1,860
Rice	12.3	8.0	.3	79.0	1,630
Wheat flour, entire wheat	11.4	13.8	1.9	71.9	1,675
White bread, as purchased	35.6	9.3	1.2	52.7	1,205
Apples, edible portion	84.6	.4	.5	14.2	290
Bananas, yellow, edible portion	75.3	1.3	.6	22.0	460
Oranges, edible portion	86.9	.8	.2	11.6	240
Strawberries, edible portion	90.4	1.0	.6	7.4	180

TABLE II.

GARDEN-PLANTING TABLE

(Condensed from Farmers' Bulletin, No. 818, United States Department of Agriculture. This table differs slightly from some of the recommendations in this book, but distances apart of plants, depth of covering seeds, etc., may often be varied widely with good results.)

[Brackets indicate that a late or second crop may be planted the same season.]

Kind of vegetable	*Seeds or plants required for 100 feet of row*	*Distance for plants to stand*		*Depth of planting*	*Time of planting in open ground (North)*	*Ready for use after planting*
		Rows apart	*Plants apart in rows*			
Artichoke, globe	½ ounce	2 to 3 ft.	2 to 3 ft.	1 to 2 in.	Spring	15 months.
Artichoke, Jerusalem	2 qts. tubers	1 to 2 ft.	1 to 2 ft.	2 to 3 in.	Spring	6 to 8 months.
Asparagus, seed	1 ounce	1 to 2 ft.	3 to 5 in.	1 to 2 in.	Early spring	3 to 4 years.
Asparagus, plants	60 to 80 plants.	12 to 24 in.	15 to 20 in.	3 to 5 in.	Early spring	1 to 3 years.
Beans, bush	1 pint	18 to 24 in.	5 or 8 to ft.	½ to 2 in.	April to July	40 to 65 days.
Beans, pole	½ pint	3 to 4 ft.	3 to 4 ft.	1 to 2 in.	May and June	50 to 80 days.
Beets	2 ounces	12 to 18 in.	5 or 6 to ft.	1 to 2 in.	April to August	60 to 80 days.
Brussels sprouts	¼ ounce	24 to 30 in.	16 to 24 in.	½ in.	May and June	90 to 120 days.

Kind of vegetable	Seeds or plants required for 100 feet of row	Distance for plants to stand		Depth of planting	Time of planting in open ground (North)	Ready for use after planting
		Rows apart	Plants apart in rows			
Cabbage, early	¼ ounce	24 to 30 in.	12 to 18 in.	½ in.	March and April. (Start in hotbed during Feb.)	90 to 130 days.
Cabbage, late	¼ ounce	24 to 36 in.	16 to 24 in.	½ in.	May and June	90 to 130 days.
Cardoon	½ ounce	2 ft.	12 to 18 in.	1 to 2 in.	April and May	5 to 6 months.
Carrot	1 ounce	18 to 24 in.	6 or 7 to ft.	½ in.	April to June	75 to 110 days.
Cauliflower	¼ ounce	24 to 30 in.	14 to 18 in.	½ in.	April to June. (Start in hotbed during Feb. or March.)	100 to 130 days.
Celeriac	¼ ounce	18 to 24 in.	4 or 5 to ft.	⅛ in.	May and June. (Start in cold frame during Apr.)	100 to 150 days.
Celery	¼ ounce	18 to 36 in.	4 to 8 in.	⅛ in.	May and June. (Start in hotbed or cold frame during March or April.)	120 to 150 days.
Chervil	1 ounce	18 to 24 in.	3 or 4 to ft.	1 in.	Autumn	1 year.
Chicory	½ ounce	18 to 24 in.	4 or 5 to ft.	½ in.	May and June	5 to 6 months.
Citron	1 ounce	8 to 10 ft.	8 to 10 ft.	1 to 2 in.	May and June	100 to 130 days.
Collards	½ ounce	24 to 30 in.	14 to 18 in.	½ in.	Late spring	100 to 120 days.
Corn salad	2 ounces	12 to 18 in.	5 or 6 to ft.	½ to 1 in.	March to September	60 days.
Corn, sweet	¼ pint	30 to 36 in.	10 to 14 in.	1 to 2 in.	May to July	60 to 100 days.
Cress, upland	½ ounce	12 to 18 in.	4 or 5 to ft.	½ to 1 in.	March to May. [Sept.]	30 to 40 days.
Cress, water	½ ounce			On surface	April to September	60 to 70 days.
Cucumber	½ ounce	4 to 6 ft.	4 to 6 ft.	1 to 2 in.	April to July	60 to 80 days.
Dandelion	¼ ounce	18 to 24 in.	8 to 12 in.	⅛ in.	Early spring	6 to 12 months.
Eggplant	½ ounce	24 to 30 in.	18 to 24 in.	½ to 1 in.	April and May. (Start in hotbed during March.)	100 to 140 days.

Kind of vegetable	*Seeds or plants required for 100 feet of row*	*Distance for plants to stand*		*Depth of planting*	*Time of planting in open ground (North)*	*Ready for use after planting*
		Rows apart	*Plants apart in rows*			
Endive	1 ounce	18 in.	8 to 12 in.	½ to 1 in	April. [July]	90 to 180 days.
Horse-radish	70 roots	24 to 30 in.	14 to 20 in.	3 to 4 in.	Early spring	1 to 2 years.
Kale, or borecole	¼ ounce	18 to 24 in.	18 to 24 in.	½ in.	August and September. [March and April.]	90 to 120 days.
Kohl-rabi	¼ ounce	18 to 24 in.	4 to 8 in.	½ in.	March to May	60 to 80 days.
Leek	½ ounce	14 to 20 in.	4 to 8 in.	1 in.	March to May	120 to 180 days.
Lettuce	½ ounce	12 to 18 in.	4 to 6 in.	½ in.	March to September	60 to 90 days.
Melon, muskmelon	½ ounce	6 to 8 ft.	Hills 6 ft.	1 to 2 in.	April to June. (Start early plants in hotbed during March.)	120 to 150 days.
Melon, watermelon	1 ounce	8 to 12 ft.	Hills 10 ft.	1 to 2 in.	May and June	100 to 120 days.
Mustard	¼ ounce	12 to 18 in.	4 or 5 to ft.	¼ in.	March to May. [Sept.]	60 to 90 days.
New Zealand spinach	1 ounce	24 to 36 in.	12 to 18 in.	1 to 2 in.	Early spring	60 to 100 days.
Okra, or gumbo	2 ounces	3 to 4 ft.	24 to 30 in.	1 to 2 in.	May and June	90 to 140 days.
Onion, seed	1 ounce	12 to 18 in.	4 or 5 to ft.	½ to 1 in.	April and May	130 to 150 days.
Onion, sets	1 quart of sets.	12 to 18 in.	4 or 5 to ft.	1 to 2 in.	Autumn and February to May.	90 to 120 days.
Parsley	¼ ounce	12 to 18 in.	3 to 6 in.	½ in.	Sept. and early spring.	90 to 120 days.
Parsnip	½ ounce	18 to 24 in.	5 or 6 to ft.	½ to 1 in.	April and May	125 to 160 days.
Peas	1 to 2 pints	30 to 36 in.	15 to ft.	2 to 3 in.	March to June	40 to 80 days.
Pepper	⅛ ounce	18 to 24 in.	15 to 18 in.	½ in.	May and June. (Start early plants in hotbed during March.)	100 to 140 days.
Physalis	½ ounce	18 to 24 in.	18 to 24 in.	½ in.	May and June	130 to 160 days.

Kind of vegetable	*Seeds or plants required for 100 feet of row*	*Distance for plants to stand*		*Depth of planting*	*Time of planting in open ground (North)*	*Ready for use after planting*
		Rows apart	*Plants apart in rows*			
Potato, Irish	5 lbs. (or 9 bu. per acre).	24 to 36 in.	14 to 18 in.	4 in.	March to June	80 to 140 days.
Potato, sweet	3 lbs. (or 75 slips).	3 to 5 ft.	14 in.	3 in.	May and June. (Start plants in hotbed during April.)	140 to 160 days.
Pumpkin	½ ounce	8 to 12 ft.	Hills 8 to 12 ft.	1 to 2 in.	May to July	100 to 140 days.
Radish	1 ounce	12 to 18 in.	8 to 12 to ft.	½ to 1 in.	March to September	20 to 40 days.
Rhubarb, seed	½ ounce	30 to 36 in.	6 to 8 in.	½ to 1 in.	Early spring	2 to 4 years.
Rhubarb, plants	33 plants	3 to 5 ft.	3 ft.	2 to 3 in.	Autumn or early spring	1 to 3 years.
Rutabaga	¼ ounce	18 to 24 in.	6 to 8 in.	½ to 1 in.	May and June	60 to 80 days
Salsify	1 ounce	18 to 24 in.	2 to 4 in.	½ to 1 in.	Early spring	120 to 180 days.
Spinach	1 ounce	12 to 18 in.	7 or 8 to ft.	1 to 2 in.	September or very early spring.	30 to 60 days.
Squash, bush	½ ounce	3 to 4 ft.	Hills 3 to 4 ft.	1 to 2 in.	April to June	60 to 80 days.
Squash, late	½ ounce	7 to 10 ft.	Hills 7 to 9 ft.	1 to 2 in.	April to June	120 to 160 days.
Tomato	⅛ ounce	3 to 4 ft.	3 ft.	½ to 1 in.	May and June. (Start early plants in hotbed during Feb. and Mar.)	100 to 140 days.
Turnip	½ ounce	18 to 24 in.	6 or 7 to ft.	¼ to ½ in.	April. [July]	60 to 80 days.
Vegetable marrow	½ ounce	8 to 12 ft.	Hills 8 to 9 ft	1 to 2 in.	April to June	110 to 140 days.

HOME GARDENER'S CALENDAR FOR NORTHERN STATES

January

READ books and other literature on gardening. Prepare plan, to scale, of garden for the coming season. Cut poles and brush for beans and peas. In the garden, stable manure may be spread or piled where it will be convenient in the spring. Tools, seed boxes, etc., may be put in good order and seeds bought.

February

In the first half of this month little more can be done than in January. In the last half, seeds of plants to be started very early may be sown in the hotbed or window box. Seeds to be planted under glass, toward the end of the month, are those of artichokes, cabbages, cauliflower, eggplant, and lettuce. Onion seed also may be sown if the plants are to be transplanted.

March

Work outlined for the latter part of February is proper for the first half of this month. There may be sown under glass seeds of artichokes, cabbage, cauliflower, cucumbers, eggplant, and tomatoes, or other plants to be set out in late

April or May. As soon as the ground is workable, seeds may be sown in it of beets, celeriac, celery, chervil, kale, kohl-rabi, leeks, mustard, onions, parsley, parsnip, smooth peas, radishes, salsify, spinach, Swiss chard, and turnips, and onion sets may be put in. In many localities it will be safe, in the latter part of the month, to set out plants of cabbage and head lettuce. Asparagus and rhubarb roots may be transplanted at any time after frost is out of the ground, and those left in a bed or row should be worked about and given manure if none was applied as a mulch in the late autumn. Late in the month the earliest potatoes may be planted, if the ground has become warm.

April

Early in the month the things suggested for March and not done then should be attended to. Seeds for sowing out of doors in April are those of beets, cabbage, carrots, cauliflower, celeriac, celery, chervil, chicory, kale, kohl-rabi, leeks, lettuce, mustard, onions, parsley, parsnip, smooth peas, radishes, salsify, spinach, Swiss chard and turnips. In the cold frame may be started seeds of tender plants not started earlier in the hotbed or window box. Artichoke, cabbage, and lettuce plants may be set out, and asparagus and rhubarb roots transplanted and cultivated. Throughout the month potatoes and Jerusalem artichokes may be planted.

May

This is the month in which most vegetables are planted in the Northern States, under the common impression that "there is no use in planting until the ground is warm." That saying is true enough regarding plants sensitive to cold, such as beans, corn, cucumbers, melons, okra, squash, and tomatoes. But part of the garden should be planted in March and April, to provide early vegetables and to prevent the "bunching" of work in May. In this month there may be planted seeds of artichokes (for next year), beans, beets, cabbage, carrots, cauliflower, celery, corn, cucumbers, kale, kohl-rabi, leeks, lettuce, melons, mustard, okra, onions, parsley, parsnip, wrinkled peas, peppers, pumpkins, radishes, spinach, squash, Swiss chard, and turnips. All the plants started under glass may safely be set in the ground by the middle of May, under normal weather conditions.

June

In this month there may be sown seeds of artichokes, beans, beets, Brussels sprouts, cabbage, carrots, cauliflower, celeriac, celery, chicory, corn, cucumbers, endive, kale, kohl-rabi, lettuce, melons, okra, peas, peppers, pumpkins, radishes, and squashes; there may be set out plants of Brussels sprouts, cabbage, cauliflower, peppers, and tomatoes, and potatoes may be planted. The latter half of the month should

give opportunity for the planting of some of these vegetables, for second crops, in place of others maturing early. Throughout June celery may be set out.

July

This month ordinarily sees little planting. But in a garden started late, or as a piece of land becomes vacant, through the maturing of a crop, there may be planted seeds of beets, cabbage, carrots, corn (early kinds), cucumbers, lettuce, peas, radishes, and turnips. Celery plants may be set out until the middle to the end of the month, according to locality, as may also plants of Brussels sprouts, cabbage, and cauliflower.

August

Planting in this month is for late or spring vegetables. Seeds of beets, kale, lettuce, peas, radishes, spinach, string beans, and turnips may be sown. Cabbage and lettuce plants may be set out.

September

Winter radish, kale, leaf lettuce, spinach, and turnip seeds may be sown. Early celery should be boarded and late celery partly earthed.

October

Celery should be banked and beets, carrots, and other roots dug for storage. Turn in all the vegetation possible as " green manure."

November

Celery should be stored or banked high. Cover asparagus with two or three inches of manure, and spinach with straw or hay. Clean up the garden and spread manure on it, especially on the part to be used for root or bulb crops in the next season.

December

Beyond spreading manure, nothing can be done in the garden except to attend to cabbage, celery, and root crops stored in pits. Begin reading and planning for next year.

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